

## **Exhibit A**

**IN THE UNITED STATES DISTRICT COURT  
FOR THE DISTRICT OF NEW JERSEY**

**IN RE VALSARTAN PRODUCTS  
LIABILITY LITIGATION**

No. 1:19-md-2875-RBK

**EXPERT REPORT OF PROFESSOR ZIRUI SONG, MD, PhD IN SUPPORT OF PLAINTIFF'S MOTION  
FOR CLASS CERTIFICATION**

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## I. QUALIFICATIONS

1. My name is Zirui Song. I am an Associate Professor of Health Care Policy at Harvard Medical School and an internal medicine physician at Massachusetts General Hospital. I practice outpatient adult primary care and inpatient general medicine on the Department of Medicine's resident teaching service at Massachusetts General Hospital, where I also teach health policy and economics to residents and fellows across specialties. I also serve as a faculty affiliate in the Harvard Medical School Center for Primary Care, where I collaborate with colleagues on policy and research projects that pertain to health care financing and primary care.

2. I received a M.D., Magna Cum Laude, from Harvard Medical School in 2014, a Ph.D. in Health Policy (Economics) from Harvard University in 2012, and a B.A. in Public Health Studies with Honors from Johns Hopkins University in 2006 (with a minor in Economics). I was a pre-doctoral and post-doctoral fellow in Aging and Health Economics at the National Bureau of Economic Research. Clinically, I did residency training in Internal Medicine at Massachusetts General Hospital from 2014 through 2017, during which I worked on different inpatient services (including general medicine, cardiology, intensive care, and oncology), rotated through different subspecialty outpatient clinics (such as dermatology, rheumatology, and clinics for patients who are homeless), and began my primary care practice that I maintain today. I received the Morton N. Swartz, M.D. Humanism in Medicine Award from the Department of Medicine at MGH.

3. I have taught health policy and health economics in undergraduate, Masters-level, and Ph.D.-level courses in the Harvard Graduate School of Arts and Sciences, Harvard T.H. Chan School of Public Health, Harvard Kennedy School, and Harvard Business School. I have also taught classes on health policy and health economics to medical students and clinical trainees (residents and fellows) at Harvard Medical School, Massachusetts General Hospital, and the Brigham and Women's Hospital, along with guest lectures at the University of Pennsylvania. I have co-directed the "Centers of Expertise in Health Policy and Management-Health Policy" course for clinical trainees at Mass General Brigham and the "Evidence, Insight and Strategy for Optimizing Health Benefits" course for U.S. employers in the Harvard Medical School Office

for External Education. This year, I currently co-direct the Harvard Medical School Essentials of the Profession (EOP) Health Policy course for first-year medical and dental students. I also lead the development of a new Health Policy concentration in the Department of Medicine Residency Program at Massachusetts General Hospital.

4. My research in health policy and economics focuses on health care financing, payment, and spending in the U.S. health care system. This work examines the pricing of health care services, policies and market forces that influence spending, and changes in provider behavior associated with changes in payment systems and incentives.<sup>1</sup> I have published approximately 100 peer-reviewed academic research articles, essays, and book chapters (including recent studies on Medicare and commercial pricing of medical services). My research has been recognized by professional organizations such as the AcademyHealth Article-of-the-Year Award in 2013 for the “best and most relevant scientific work in the fields of health services research and health policy,” the “Ten Influential Studies in Health Services Research” from the National Academy of Medicine, and the 2020 Health Care Research Award from the National Institute for Health Care Management Foundation. I have been honored to receive the 2016 Seema S. Sonnad Emerging Leader in Managed Care Research Award from the *American Journal of Managed Care*, Bernie J. O'Brien New Investigator Award from the International Society for Pharmacoeconomics and Outcomes Research, and 2020 Outstanding Junior Investigator of the Year from the Society of General Internal Medicine. I also serve on the editorial board of *PLOS Medicine*.

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<sup>1</sup> See, for example: Z. Song, *et al.*, “Changes in Health Care Spending and Quality 4 Years into Global Payment,” *New England Journal of Medicine*, 371(18), 2014, pp. 1704-1714; Z. Song, *et al.*, “Health Care Spending, Utilization, and Quality 8 Years into Global Payment,” *New England Journal of Medicine*, 381(3), 2019, pp. 252-263; Z. Song, *et al.*, “Lower-Versus Higher-Income Populations in the Alternative Quality Contract: Improved Quality and Similar Spending,” *Health Affairs*, 36(1), 2017, pp. 74-82; D. Haas, *et al.*, “Evaluation of Economic and Clinical Outcomes Under Centers for Medicare & Medicaid Services Mandatory Bundled Payments for Joint Replacements,” *JAMA Internal Medicine*, 179(7), 2019, pp. 924-931; Z. Song, “The Pricing of Care Under Medicare for All: Implications and Policy Choices,” *Journal of the American Medical Association*, 322(5), 2019, pp. 395-396; Z. Song, *et al.*, “Out-Of-Network Spending Mostly Declined in Privately Insured Populations With A Few Notable Exceptions From 2008 To 2016,” *Health Affairs*, 39(6), 2020, pp. 1032-1041; Z. Song and D.A. Chokshi, “The Role of Private Payers in Payment Reform,” *Journal of the American Medical Association*, 313(1), 2015, pp. 25-26; Z. Song, T. Lillehaugen, and J. Wallace, “Out-of-Network Laboratory Test Spending, Utilization, and Prices in the US,” *Journal of the American Medical Association*, 325(16), 2021, pp. 1674-1676.

5. I have worked on federal payment policy at the U.S. Department of Health and Human Services concerning payments to private insurers in the Medicare Advantage program. This work helped motivate several subsequent academic papers that also pertain to the differences in prices of health care services in the U.S. across public and private insurers.<sup>2</sup> I have served as a Visiting Fellow in the Massachusetts Health Policy Commission and on the Massachusetts Medical Society Task Force on Health Care Reform. I have also served on Technical Expert Panels for the U.S. Department of Health and Human Services and the Health Care Cost Institute.

6. A more detailed description of my qualifications is provided in my Curriculum Vitae, in Attachment A. Attachment B lists the materials I relied upon for this report. I am compensated for this matter at an hourly rate. This compensation is not contingent upon the outcome of this matter. The opinions I state in this report are stated within a reasonable degree of professional certainty. My analysis of the issues at hand is ongoing. I reserve the right to respond to, rebut, opine on, or incorporate opinions offered by other experts in these matters. I reserve the right to modify or supplement this report based on new materials or testimony that may become available to me, including, but not limited to, other expert witness reports.

## II. ASSIGNMENT

7. In this matter, the complaint alleges that, since September 2012, Defendants have marketed and sold valsartan-containing drugs (VCDs) that were “contaminated with unintended nitrosamine impurities” of N-nitrosodimethylamine (“NDMA”) and/or N-nitrosodiethylamine (“NDEA”) and therefore “nonmerchantable.”<sup>3</sup> Defendants allegedly misrepresented to consumers that these generic VCDs were safe and bioequivalent to their brand counterparts, even though they were not and “willfully ignored deficiencies and warning signs regarding the

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<sup>2</sup> Z. Song, “Using Medicare prices—Toward Equity and Affordability in the ACA Marketplace,” *New England Journal of Medicine*, 377(24), 2017, pp. 2309-2311; Z. Song and S. Basu, “Improving Affordability and Equity in Medicare Advantage,” *Inquiry*, 56, 2019, pp. 1-7; Z. Song, “Making the Affordable Care Act Marketplace More Affordable,” *JAMA Health Forum*, 2(5), 2021, pp. 1-3.

<sup>3</sup> See Consolidated Third Amended Medical Monitoring Class Action Complaint, in this matter, filed November 1, 2021 (hereafter “Complaint”), pp. 2-4.

operating standards and manufacturing and testing conditions” in some of their manufacturing plants.<sup>4</sup> The complaint contends that Defendants’ conduct exposed Plaintiffs to “highly dangerous and potentially fatal carcinogenic substances” and therefore Defendants should “fund medical monitoring” and (among other things) pay Plaintiffs “compensatory damages necessary for their monitoring and care.”<sup>5</sup> The medical monitoring class is defined as all persons who consumed the Defendants VCDs containing NDMA or NDEA, and who accumulated sufficient quantities of lifetime cumulative exposure to require medical monitoring given the increased risk of cellular and genetic injury leading to an increased risk of cancer.

8. A major question has emerged in this setting. Given the need for medical monitoring of individuals who have consumed NDMA or NDEA through the pharmaceutical agents in this case, is there a common methodology for determining the potential health care **spending** accrued from the medical monitoring of these individuals given their increased risk of cancer?

9. As detailed below, this report begins by providing an overview of the pricing of health care services in the U.S., including a definition of key terminology, a description of the Current Procedural Terminology (CPT) coding system, and an explanation of how the prices of health care services are determined—both in public health insurance programs (notably the federal Medicare program) and in the commercial health insurance sector (Section III). Specifically, it explains how physician fees are calculated using relative value units, which are multiplied by a conversion factor to derive final prices in U.S. dollar terms, and why prices can differ based on not only the insurer, but also the site of care and the in-network or out-of-network status of the health care provider with respect to a person’s health insurance plan. Next, the report describes a common methodology for estimating health care spending associated with a medical monitoring program (Section IV). It provides several examples of services that could plausibly be included in a monitoring program to illustrate how the common methodology would work. Finally, the

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<sup>4</sup> Complaint, pp. 3-4.

<sup>5</sup> Complaint, pp. 5 and 230-231.

report briefly addresses how spending on medical monitoring could be determined for the class of patients.

10. For the sake of clarity, I am opining about the medical services (medical benefits) for the medical monitoring class members, and not offering an opinion regarding the pharmacy benefits for these plans. I am offering no opinion on the cost of the consumers' or third-party purchasers' purchases for VCDs or the costs of such generic drugs under the pharmacy benefit.

### III. PRICING OF HEALTH CARE SERVICES

#### A. Definitions

11. A discussion of the pricing of health care services in the U.S. first requires a foundation of clear terminology. For the purposes of this report and following the convention of the health policy and health economics scholarship, I first define and distinguish between several related, but different, entities: **price**, **charge**, **spending**, and **cost**. I define the components of price, namely the insurer component of the price and the patient component of the price (cost-sharing).

12. The **price** of a health care service is defined as the total paid amount per unit of service, which encompasses the insurer component and the patient component.<sup>6</sup> The price is typically determined in two main ways, based on the insurer. First, it is administratively set, in other words regulated, in public insurance programs, namely Medicare, which leaves no room for negotiation with health care providers. This is essentially a final offer to health care providers, who act as "price takers" in Medicare. Second, prices are determined through negotiation in commercial health insurance, in which commercial insurers and health care providers come together to bargain and agree on the prices per unit of service that the insurers will reimburse the providers. Details of how Medicare and commercial prices are set are explained below.

13. For patients with health insurance, the price of a health care service often comprises a portion that the insurer pays and a portion that the patient pays. The latter is generally described

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<sup>6</sup> Association of American Medical Colleges (AAMC), "Price Transparency: Common Definitions" ([https://www.aamc.org/system/files/c/2/450000-pricetran\\_commondefs.pdf](https://www.aamc.org/system/files/c/2/450000-pricetran_commondefs.pdf)).



as “cost-sharing” and can be implemented through a deductible, a co-insurance, or a copayment (copay). Another term that is often interchangeable with “cost-sharing” is the “out-of-pocket” spending for the patient, although the latter may also include the monthly premiums or enrollment costs to carry insurance, in addition to the cost-sharing at the point of care. To define the elements of cost-sharing, a deductible is a fixed amount that an insured patient must pay at the beginning of an insurance period (typically a year) before insurance benefits begin. Co-insurance is a fixed share or percentage of prices that the patient pays (it proportionally increases with the price). A copayment is a fixed dollar amount per unit of service that the patient pays.

14. In contrast to price, the **charge** of a service is the provider’s asking price. The charge typically far exceeds the price, whether a price is administratively set or negotiated. Charges comes from the “chargemaster,” a private document that providers have which lists the asking price of every service that a hospital or physician charges.<sup>7</sup> Literature and evidence from patient bills suggest that chargemaster amounts are often extremely high and not justified.<sup>8</sup> Notably, charges from a chargemaster do not reflect the negotiation between insurers and providers that in-network prices do. Nor do they reflect any administratively set price in the public domain, such as the Medicare prices also discussed above. Rather, chargemaster amounts are generally known to be unilaterally and solely determined by the provider.<sup>9</sup> While charges are rarely paid for patients who have health insurance, charges are commonly faced by uninsured or underinsured patients who do not have the benefit of insurers setting or negotiating a price on their behalf. In these cases, patients can be charged the full asking price of the provider or charged the remaining balance of a bill after a portion is paid by insurance (known as a balance

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<sup>7</sup> AAMC, “Price Transparency: Common Definitions,” *opt. cit.*

<sup>8</sup> B. Richman, M. Hall, and K. Schulman, “Overbilling and Informed Financial Consent--a Contractual Solution,” *New England Journal of Medicine*, 367(5), 2012, pp. 396-397 at p. 396; E. Rosenthal, “After Surgery, Surprise \$117,000 Medical Bill From Doctor He Didn’t Know,” *The New York Times*, September 20, 2014 (<https://www.nytimes.com/2014/09/21/us/drive-by-doctoring-surprise-medical-bills.html>); S. Kliff, “The Case of the \$629 Band Aid—and What it Reveals About American Health Care,” *Vox*, May 13, 2016 (<https://www.vox.com/2016/5/13/11606760/emergency-facility-fees-american-health-care>); S. Kliff, “He Went to an In-Network Emergency Room: He Still Ended Up with a \$7,924 Bill,” *Vox*, May 23, 2018 (<https://www.vox.com/2018/5/23/17353284/emergency-room-doctor-out-of-network>).

<sup>9</sup> G. Bai, and G. F. Anderson, “US Hospitals Are Still Using Chargemaster Markups to Maximize Revenues,” *Health Affairs*, 35(9), 2016, pp. 1658-1664 at p. 1658.

bill). In considering the prospective spending for a medical monitoring program, it would be generally applicable to think about the **prices** per unit of component services as defined above for patients whose insurance will cover the clinical monitoring services (which includes the portion paid by the insurer and the patient cost-sharing as defined above).<sup>10</sup> However, for patients who are uninsured or whose insurance will not cover the clinical monitoring services, the provider **charge** may need to be considered as the operative price.

15. In contrast to the price and charge, health care **spending** is defined as the total dollars spent on health care services—in other words, the prices of services multiplied by the quantity of services. Of course, spending on one unit of a service would simply equal the price of the service. However, in most situations, spending is an aggregate concept that encompasses the prices and quantities of different health care services. For example, it is the correct terminology to describe total national or state resources that goes to health care services.

16. Finally, the term **cost** is commonly used in the lay press and colloquially to mean either price or spending, but from a technical standpoint, the cost of health care refers to the input costs of production, or the resources required to produce a service.<sup>11</sup> This includes facilities, machines, and human resources, in other words costs incurred by the provider in order to provide a health care service. Table 1 below succinctly summarizes the definitions of these four key concepts. For the purposes of this report, I will adhere to these definitions above and will use the terms **price** and **spending** most frequently in the remainder of the report.

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<sup>10</sup> For the purposes of this report, Counsel has instructed me to think about both the insurer portion and patient portion in considering the unit price of a health care service.

<sup>11</sup> AAMC, “Price Transparency: Common Definitions,” *opt. cit.*

**TABLE 1**  
**DEFINITION OF KEY TERMS**

<b>Key term</b>	<b>Brief definition in the context of health care services</b>
Price	Paid amount per unit of service, including insurer and patient components
Charge	Provider's unilateral asking amount from the chargemaster; exceeds the price
Spending	Total dollars spent; prices of services multiplied by quantities of services
Cost	Cost of producing health care services, including facility and human inputs

## **B. Pricing of Medical and Procedural Services in the U.S. Health Care System**

17. The prices of health care services are delineated according to a fee schedule used by public and private insurers (sometimes called “payers”), on which each service has a unique Current Procedural Terminology (CPT) code. The CPT coding system has long been used by health care providers and insurers across the country for claims processing and reimbursement of health care services, and serves as the foundation or skeleton for the nomenclature of health care services. Created over five decades ago, it is managed by the American Medical Association’s CPT Editorial Panel and recognized by the U.S. Department of Health and Human Services as a national coding set for health care provider services.<sup>12</sup> It is a uniform, standardized coding system in which each service is denoted by a five-digit alpha-numeric or numeric code (for example, 99213 for a 15-minute office visit of an established patient).<sup>13</sup> This standardization is important because patients may receive care from different physician and hospitals, who in turn can treat patients with various types of health insurance. The coding system thus gives public and

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<sup>12</sup> American Medical Association (AMA), “CPT® Overview and Code Approval” (<https://www.ama-assn.org/practice-management/cpt/cpt-overview-and-code-approval>).

<sup>13</sup> *Ibid.*

private insurers, providers, and policymakers a common language with which to use for claims submission, processing, and payment.

18. With each health care service designed through a CPT code, the pricing of services takes place in two stages. In stage 1, each service code receives an underlying valuation, quantified in relative value units (RVUs). RVUs come from the Resource-Based Relative Value Scale, a system that assigns a valuation (a number) on a uniform linear scale (from zero upward) to each physician service “based on the resources” required to produce and deliver that service—thus enabling different services to be compared to each other, hence the phrase “relative value.” This uniform scale enabled medical services that differ substantially in nature, such as a surgery, an X-ray image, and a psychotherapy visit to be valued using an analogous, apples-to-apples metric. Importantly, RVUs are not dollars; rather, they are abstract units of “worth” or value that must be converted to dollars through an RVU conversion factor as described below.<sup>14</sup>

19. The Resource-Based Relative Value Scale was signed into law in 1989 and implemented by the federal Health Care Financing Administration on January 1, 1992.<sup>15</sup> It was created with the launch of the Medicare Physician Fee Schedule and remains the dominant system of valuation of physician services for public and private insurers in the U.S. today.<sup>16</sup> Today, the Centers for Medicare and Medicaid Services (CMS) is ultimately responsible for the valuations of physician services using the Resource-Based Relative Value Scale and publishes valuations on an annual basis. The American Medical Association’s Relative Value Scale Update Committee, which is a multispecialty committee of about 32 or so members, many appointed by major

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<sup>14</sup> Medicare Payment Advisory Commission (MedPAC), “Payment Basics: Physician and Other Health Professional Payment System,” October 2020 ([http://www.medpac.gov/docs/default-source/payment-basics/medpac\\_payment\\_basics\\_20\\_physician\\_final\\_sec.pdf?sfvrsn=0](http://www.medpac.gov/docs/default-source/payment-basics/medpac_payment_basics_20_physician_final_sec.pdf?sfvrsn=0)); AMA, “2021 RVS Update Process” (<https://www.ama-assn.org/system/files/2020-09/ruc-update-booklet.pdf>).

<sup>15</sup> W. Hsiao, *et al.*, “Results and Impacts of the Resource-Based Relative Value Scale,” *Medical Care*, 30(11 Suppl), 1992, pp. NS61-79 at p. NS61; W. Hsiao, *et al.*, “An Overview of the Development and Refinement of the Resource-Based Relative Value Scale,” *Medical Care*, 30(11 Suppl), 1992, pp. NS1-12 at p. NS1; J. Levy, *et al.*, “Understanding the Medicare Fee Schedule and its Impact on Physicians Under the Final Rule,” *Medical Care*, 30(11 Suppl), 1992, pp. NS80-94 at p. NS80.

<sup>16</sup> AMA, “RVS Update Committee (RUC)” (<https://www.ama-assn.org/about/rvs-update-committee-ruc/rvs-update-committee-ruc>).

national medical societies, provides CMS recommendations on how many RVUs to assign to any given physician service, including the ED evaluation and management services in this matter. CMS generally accepts the recommendations of the committee.<sup>17</sup>

20. Each physician service's total RVUs is comprised of three components: (1) RVUs for physician "work," (2) RVUs for "practice expense," and (3) RVUs for "professional liability insurance" or, historically, "malpractice" risk.<sup>18</sup> The amount of RVUs assigned to these three components are determined from survey data and other sources that the Relative Value Scale Update Committee reviews. Work RVUs reflect the amount or intensity of physician diagnostic or treatment effort that goes into a service (*e.g.*, a technically complex procedure will carry more work RVUs than an office visit). Practice expense RVUs aim to reflect the input costs of production such as tools, operating tables, scanners, and other resources.<sup>19</sup> These first two components of the RVU—work and practice expense—generally comprise the bulk of the total RVUs. Lastly, malpractice RVUs reflect the risk of litigation (*e.g.*, a high-risk procedure will carry more malpractice RVUs than an office visit).

21. For each service, its RVUs are converted into its price by multiplying the total number of RVUs by a RVU conversion factor. The RVU conversion factor is defined as a certain number of dollars per RVU. In 2021, for example, the RVU conversion factor in Medicare is \$34.8931 per RVU. The federal Medicare program does not negotiate with providers on either the RVU assignments or the RVU conversion factor. In other words, Medicare has substantial purchasing power as a large payer (and legislative authority) to set the prices it is willing to pay. In turn,

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<sup>17</sup> M. Laugesen, R. Wada, and E. Chen, "In Setting Doctors' Medicare Fees, CMS Almost Always Accepts the Relative Value Update Panel's Advice on Work Values," *Health Affairs*, 31(5), 2012, pp. 965-972; MedPac, "Report to the Congress: Medicare Payment Policy," March 13, 2020 ([http://medpac.gov/docs/default-source/reports/mar20\\_entirereport\\_sec.pdf?sfvrsn=0](http://medpac.gov/docs/default-source/reports/mar20_entirereport_sec.pdf?sfvrsn=0)).

<sup>18</sup> MedPAC, 2020, *opt. cit.*, United States Government Accountability Office, "Medicare Physician Fees: Geographic Adjustment Indices Are Valid in Design, but Data and Methods Need Refinement," Report to Congressional Committees, March 2005 (<https://www.gao.gov/assets/gao-05-119.pdf>); W. Hsiao, *et al.*, "Resource-Based Relative Values: An Overview," *JAMA*, 260(16), 1988, pp. 2347-2353; S. Maxwell, S. Zuckerman, R.A. Berenson, "Use of Physicians' Services Under Medicare's Resource-Based Payments," *New England Journal of Medicine*, 356(18), 2007, pp. 1853-1861.

<sup>19</sup> *Ibid.*

health care providers are “price takers;” if they choose to provide medical services to a Medicare beneficiary, they would be reimbursed at the traditional fee-for-service Medicare price.<sup>20</sup> Table 2 shows the number of RVUs in 2021 for several example services, and their resulting Medicare prices given the 2021 Medicare conversion factor. Other key details of the Medicare payment system for physician services are described by the MedPAC’s overview of the payment system for physician and health professional services.<sup>21</sup>

**TABLE 2**  
**2021 RELATIVE VALUE UNITS (RVUS) AND MEDICARE PRICES FOR EXAMPLE SERVICES**

Service (CPT Code)	Relative Value Units (RVUs) in Medicare				Medicare Conversion Factor (CF)	Medicare Price (RVUs x CF)
	Physician Work	Practice Expense	Professional Liability	Total RVUs		
Electrocardiogram (93010)	0.17	0.06	0.01	0.24	\$34.89/RVU	\$8.37
Mid-level office visits (99213)	1.30	1.25	0.10	2.65	\$34.89/RVU	\$92.47
High-level ED visit (99285)	4.00	0.75	0.43	5.18	\$34.89/RVU	\$180.75

Notes: physician work RVUs, practice expense RVUs, professional liability insurance RVUs, the Medicare conversion factor, and the Medicare price are all public data reported in the Medicare Physician Fee Schedule by the Centers for Medicare and Medicaid Services.<sup>22</sup>

<sup>20</sup> Even a physician or hospital who treats a Medicare beneficiary in Medicare Advantage (a private Medicare plan) as an out-of-network provider must, by law, accept the traditional fee-for-service Medicare price as payment in full. The relevance of provider network status for prices in commercial insurance is discussed in section C below.

<sup>21</sup> MedPAC, 2020, *opt. cit.*

<sup>22</sup> Centers for Medicare and Medicaid Services (CMS), “Medicare Physician Fee Schedule Lookup Tool” (<https://www.cms.gov/medicare/physician-fee-schedule/search/overview>). To find RVUs and the Medicare Conversion Factor, type the CPT codes into the “HCPCS Code” field” and under “MAC Option,” select “National Payment Amount.”

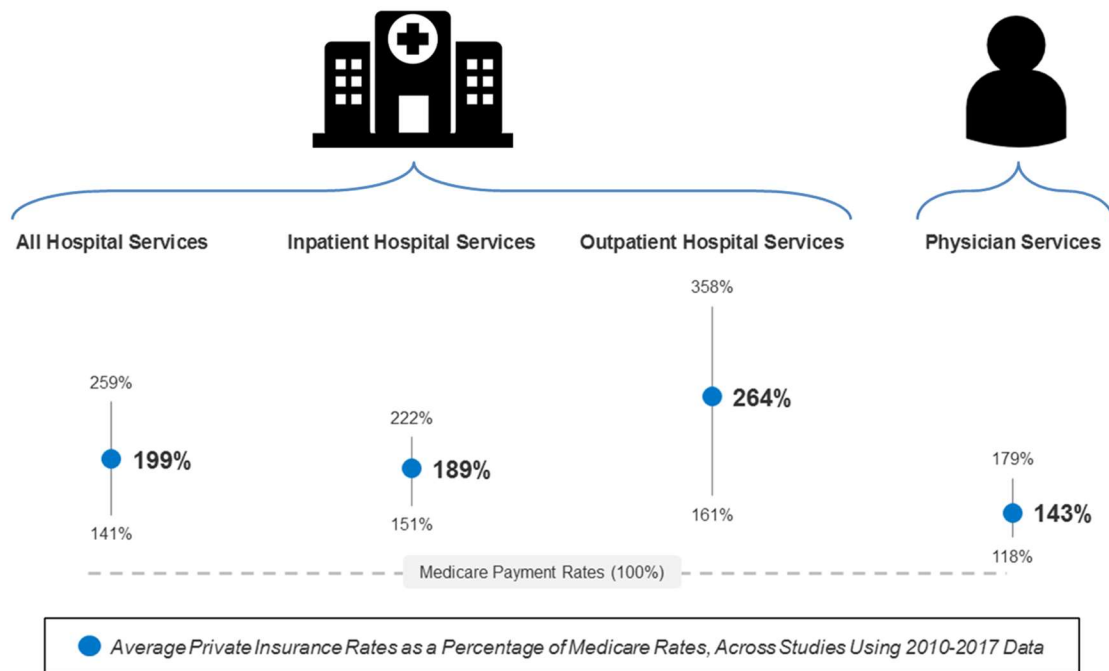
22. Commercial insurers generally use the same underlying RVU valuations as those used by Medicare. However, unlike the national RVU conversion factor that Medicare administratively sets and publishes each year, the RVU conversion factor that determines a commercial insurer's price is typically negotiated between the insurer and individual provider groups in their insurance networks. Moreover, this is typically private information. However, a large research evidence base has revealed that U.S. commercial insurer prices for physician services are 43% higher (a ratio of 1.43), on average, compared to Medicare prices for the same service.<sup>23</sup> U.S. commercial insurer prices for hospital outpatient services (often called "HOPD," "OPD," or "Outpatient Hospital Services" as in the figure below) are on average 164% higher (a ratio of 2.64) than Medicare prices.<sup>24</sup> An example of a hospital outpatient service is an emergency department visit. The key figure from the Lopez, *et al.*, meta-analysis (2020) cited here is shown below as Figure 1.

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<sup>23</sup> E. Lopez, *et al.*, "How Much More Than Medicare Do Private Insurers Pay? A Review of the Literature," Kaiser Family Foundation Issue Brief, April 15, 2020 (<https://www.kff.org/report-section/how-much-more-than-medicare-do-private-insurers-pay-a-review-of-the-literature-issue-brief/>). See also the 19 individual studies that comprised this meta-analysis.

<sup>24</sup> *Ibid.*

**FIGURE 1**  
**COMMERCIAL VS. MEDICARE PRICES IN THE U.S.—A SUMMARY OF THE EVIDENCE**



SOURCE: KFF analysis of 19 published studies comparing private insurance and Medicare payments to providers. Because some studies analyze payments to providers in multiple service categories, the number of studies across all categories is greater than 19.



23. The underlying RVUs for each service are typically the same in commercial insurance as in Medicare. However, the average commercial insurer RVU conversion factor for physician services has been roughly \$49.90 per RVU ( $\$34.8931 \times 1.43 = \$49.8971$ ), according to the 1.43 ratio in Lopez, *et al.* (2020). The commercial insurer RVU conversion factor for hospital outpatient services has averaged \$92.12 per RVU ( $\$34.8931 \times 2.64 = \$92.1178$ ), using the 2.64 ratio in Lopez, *et al.* (2020). In other words, price differences between Medicare and commercial insurers are generally due to differences in the conversion factor, rather than differences in the underlying RVUs of services. Building on this fact, Table 3 estimates average commercial prices in the U.S. for the same example services shown in Table 2. While this Table shows a national



average estimate using the conversion factors above, commercial prices for a given service vary substantially by geography due to differences in provider market power relative to insurers.<sup>25</sup>

**TABLE 3**  
**ESTIMATED 2021 AVERAGE U.S. COMMERCIAL PRICES FOR THE SAME EXAMPLE SERVICES**

Service (CPT Code)	Relative Value Units (RVUs) in Medicare				Commercial Insurer Conversion Factor (CF)	Commercial Insurer Price (RVUs x CF)
	Physician Work	Practice Expense	Professional Liability	Total RVUs		
Electrocardiogram (93010)	0.17	0.06	0.01	0.24	\$49.90/RVU	\$11.98
Mid-level office visit (99213)	1.30	1.25	0.10	2.65	\$49.90/RVU	\$132.23
High-level ED visit (99285)	4.00	0.75	0.43	5.18	\$92.12/RVU	\$477.17

Notes: physician work RVUs, practice expense RVUs, and professional liability insurance RVUs are public data reported in the Medicare Physician Fee Schedule by the Centers for Medicare and Medicaid Services.<sup>26</sup> Given the data in Lopez, *et al.* (2020) described in the text above, I used the commercial-to-Medicare price ratio of 1.43 to derive the conversion factor of \$49.90/RVU for the electrocardiogram and mid-level office visit, as these services can be delivered in a freestanding physician office. I used the commercial-to-Medicare price ratio of 2.64 for the ED visit, given that ED visits are most often delivered in the facility setting.

24. Outside of Medicare (which covers about 61 million people or approximately 14% of the U.S. population)<sup>27</sup> and commercial insurance (which covers over half of the U.S. population), a large portion of the nation's population—over 72.5 million Americans—receive health insurance coverage through Medicaid, which is a joint federal-state health insurance program that insures a large share of the nation's children, pregnant women, low-income adults, and disabled persons.<sup>28</sup> Every state administers its own Medicaid program, supported by matching funds from the federal

<sup>25</sup> C. White and C. Whaley, "Prices Paid to Hospitals by Private Health Plans Are High Relative to Medicare and Vary Widely: Findings from an Employer-Led Transparency Initiative," *RAND Corporation Research Reports*, 2019, pp. 18-31 ([https://www.rand.org/pubs/research\\_reports/RR3033.html](https://www.rand.org/pubs/research_reports/RR3033.html)).

<sup>26</sup> CMS, "Medicare Physician Fee Schedule Lookup Tool," *op. cit.*

<sup>27</sup> CMS, "Total Medicare Enrollment: Total, Original Medicare, and Medicare Advantage and Other Health Plan Enrollment, Calendar Years 2014-2019" (<https://www.cms.gov/files/document/2019cpsmdcrenrollab1.pdf>).

<sup>28</sup> Medicaid.gov, "Eligibility" (<https://www.medicare.gov/medicaid/eligibility/index.html>).

government. States vary in the design of their Medicaid programs, including prices. In general, Medicaid prices are lower than Medicare prices. On average, using 2016 data, it was estimated that Medicaid prices nationwide are approximately 72% of Medicare prices, though beneath this average is sizeable heterogeneity by state.<sup>29</sup> For example, Florida Medicaid prices were 56% of Medicare levels, while Virginia Medicaid prices were 92% of Medicare levels.

25. Lastly, about 2% of the U.S. population receive health insurance through other federal public programs, notably the Veterans Administration (VA) for veterans, Tricare for the military and families, and the Indian Health Service (IHS) for Native American populations. In general, these public programs pay health care providers Medicare prices.<sup>30</sup>

### **C. Pricing of Laboratory Services in the U.S. Health Care System**

26. Before 2018, Medicare administratively set prices of laboratory tests based on the historical amounts charged by laboratory providers and capped them legislatively at certain levels.<sup>31</sup> This resulted in the Medicare Clinical Laboratory Fee Schedule. Congress first set limits on prices called national limitation amounts in 1986, and actual Medicare prices were the lesser of (1) a laboratory's charges, (2) the local fee schedule amount and (3) the national limitation amount.<sup>32</sup> Empirically, the national limitation amount is often the paid amount. For example, an Office of Inspector General report found that 89% of Medicare laboratory tests in 2007 were

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<sup>29</sup> Kaiser Family Foundation, "Medicaid-to-Medicare Fee Index" (<https://www.kff.org/medicaid/state-indicator/medicaid-to-medicare-fee-index>)

<sup>30</sup> Department of Veterans Affairs, "Veterans Community Care Program, Final Rule," *Federal Register*, 84(108), 2019, pp. 26278-26310; 10 U.S. Code, Chapter 55 – Medical and Dental Care, Section 1079, "Contracts for medical care for spouses and children: plans," (<https://uscode.house.gov/view.xhtml?path=/prelim@title10/subtitleA/part2/chapter55&edition=prelim>); Indian Health Service (IHS), CMS, Health and Human Services (HHS), "Section 506 of the Medicare Prescription Drug, Improvement, and Modernization Act of 2003—Limitation on Charges for Services Furnished by Medicare Participating Inpatient Hospitals to Individuals Eligible for Care Purchased by Indian Health Programs, Final Rule," *Federal Register*, 72(106), 2007, pp. 30706-30711.

<sup>31</sup> CMS, "Medicare Will Use Private Payor Prices to Set Payment Rates for Clinical Diagnostic Laboratory Tests Starting in 2018," CMS press release, June 17, 2016 (<https://www.cms.gov/newsroom/press-releases/medicare-will-use-private-payor-prices-set-payment-rates-clinical-diagnostic-laboratory-tests>).

<sup>32</sup> Department of Health and Human Services (HHS), "Medicare Reimbursement for Outpatient Laboratory Services," Office of Inspector General Report, March 1989 (<https://oig.hhs.gov/oei/reports/oi-04-88-01080.pdf>).

paid at the national limitation amount.<sup>33</sup> This national limitation amount was initially set at 115% of the median of all local fee schedule amounts.<sup>34</sup> However, Congress has periodically lowered this cap to create savings. Since 1998, national limitation amounts have been set at 74% of the median of all local fee schedule amounts (100% of the median for new tests performed on or after 2001).<sup>35</sup> Before 2018, the Medicare Clinical Laboratory Fee Schedule prices had exceeded commercial prices in part because Medicare did not adjust prices to reflect modern efficiencies in laboratory testing, including the changes in technology (lower input costs) or market conditions.

27. Starting in 2018, however, Medicare based laboratory pricing on commercial insurer prices. This was a major change in the way that the federal government pays for laboratory tests, and it was codified in the Protecting Access to Medicare Act of 2014 (PAMA). PAMA required laboratories to report the prices they receive from private insurers, which Medicare then uses to establish its own prices.<sup>36</sup> In January 2018, Medicare began paying for laboratory tests using the volume-weighted median of all reported commercial insurer prices collected from laboratories during the period between January and June 2016.<sup>37</sup> These commercial insurer-based prices were not subject to any adjustments (*e.g.*, for geography, annual updates, or budget neutrality requirements). Rather, they will only be updated when Medicare collects another round of data.<sup>38</sup> PAMA also created a new category of laboratory tests called “advanced diagnostic laboratory tests,” which includes more complex molecular and genetic tests; these have separate reporting

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<sup>33</sup> HHS, “Variation in the Clinical Laboratory Fee Schedule,” Office of Inspector General Report, July 2009 (<https://oig.hhs.gov/oei/reports/oei-05-08-00400.pdf>).

<sup>34</sup> MedPAC, “Chapter 9: Mandated report: Assessing the impact of recent changes to Medicare’s clinical laboratory fee schedule payment rates,” Report to the Congress: Medicare and the Health Care Delivery System, June 2021 ([http://www.medpac.gov/docs/default-source/default-document-library/jun21\\_medpac\\_report\\_to\\_congress\\_sec.pdf?sfvrsn=0](http://www.medpac.gov/docs/default-source/default-document-library/jun21_medpac_report_to_congress_sec.pdf?sfvrsn=0)).

<sup>35</sup> *Ibid.*

<sup>36</sup> CMS, “Summary of Data Reporting for the Medicare Clinical Laboratory Fee Schedule (CLFS) Private Payor Rate-Based Payment System,” September 22, 2017, pp. 1-11 at p. 1 (<https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/ClinicalLabFeeSched/Downloads/CY2018-CLFS-Payment-System-Summary-Data.pdf>).

<sup>37</sup> *Ibid.*, p. 2.

<sup>38</sup> S. Murrin, Department of Health and Human Services, “Changing How Medicare Pays for Clinical Diagnostic Laboratory Tests: An Update on CMS’s Progress,” Update from the Deputy Inspector General for Evaluation and Inspections, September 2016, pp. 1-16 at p. 2 (<https://oig.hhs.gov/oei/reports/oei-09-16-00100.pdf>).

and payment requirements, and are also more expensive than the more routine tests.<sup>39</sup> The full impact of the changes in prices under PAMA from the first round of data reporting was phased in over the period 2018-2022, during which the impact in any one year would be capped at a given level. From 2018 through 2020, payment rate reductions were capped at 10 percent per year. In 2021, they were capped at 0 percent (therefore, no reductions). In 2022, they are scheduled to be capped at 15 percent. Any payment rate increases under the PAMA, which were also possible based on the laboratory reported commercial insurer prices, were implemented immediately in 2018.<sup>40</sup>

#### **D. Variations in Prices Within Insurers**

28. Not only do the prices of health care services vary *between* insurers, such as the major public insurer Medicare and commercial insurers as Section B above illustrated, the price of a given service can also differ in important ways *within* a given insurer. This section describes two notable ways that prices vary within insurers: differences across sites of care, and differences by in-network or out-of-network status of the health care provider in a person's insurance plan.

29. Prices vary based on the site of care. In an independent, physician-owned practice setting (most commonly a freestanding outpatient physician office in the community), public and private insurers will reimburse the provider a single, aggregate fee for a given health care service. There is no distinction between a facility component or a professional component of the fee. However, when a service is delivered in a facility setting, frequently the "hospital outpatient department" (often referred to as the "HOPD" or "OPD") setting, it garners two fees—a "facility fee" for the hospital and a "professional fee" for the physician. Although the physician fee in the facility setting is typically lower than the single fee in the freestanding physician office setting, the sum of the facility fee and professional fee in the facility setting generally exceeds the latter, typically

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<sup>39</sup> *Ibid.*, p. 13.

<sup>40</sup> MedPAC, 2021, *opt. cit.*

by a substantial margin.<sup>41</sup> Table 4 below from MedPAC’s June 2013 Report to the Congress provides a classic example of this difference in Medicare price by site of care.<sup>42</sup> In this example using a mid-level office visit (CPT code 99213), the Medicare price is \$72.50 in the freestanding physician office setting, but \$123.38 in the hospital outpatient department setting (\$73.68 for the facility fee, and \$49.70 for the professional fee). This type of gap is analogous for essentially all services that can be delivered in a freestanding office setting and a facility setting. Of note, when a freestanding physician office is acquired by a hospital, as is common through vertical consolidation, the physician’s site of care may acutely change to the facility setting.<sup>43</sup> The result is that a given medical service previously delivered in a freestanding physician office, now delivered in the facility setting, becomes higher priced even if the actual physician, the patient, and the service does not change.<sup>44</sup>

**TABLE 4**  
**MEDICARE PRICE FOR A MID-LEVEL EVALUATION AND MANAGEMENT OFFICE VISIT IN A**  
**FREESTANDING PHYSICIAN PRACTICE VS. HOSPITAL OUTPATIENT DEPARTMENT (OPD)**

	Service provided in freestanding physician practice*	Service provided in OPD		
		Physician facility rate*	OPPS rate	Total, OPD rate
Program payment	\$58.00	\$39.76	\$58.94	\$98.70
Beneficiary cost sharing	<u>14.50</u>	<u>9.94</u>	<u>14.74</u>	<u>24.68</u>
Total payment	72.50	49.70	73.68	123.38

Note: E&M (evaluation and management), OPD (hospital outpatient department), OPPS (outpatient prospective payment system). The Current Procedural Terminology code for this visit is 99213.

\*Paid under the Medicare physician fee schedule.

Source: MedPAC analysis of payment rates in the 2013 physician fee schedule and OPPS.

Note: The CPT code for a mid-level (15-minute) evaluation and management office visit for an established patient is 99213. This is one of the most common medical services in the U.S.

<sup>41</sup> MedPAC, “Report to the Congress: Medicare and the Health Care Delivery System,” June 2013, pp. 3-281 at pp. 31-32 ([http://medpac.gov/docs/default-source/reports/jun13\\_entirereport.pdf](http://medpac.gov/docs/default-source/reports/jun13_entirereport.pdf)).

<sup>42</sup> *Ibid.*

<sup>43</sup> In some cases, the physician’s office may not need to physically relocate into the facility setting. The change in ownership or affiliation may be sufficient to qualify the practice as facility-based.

<sup>44</sup> Z. Song, *et al.*, “Medicare Fee Cuts and Cardiologist-Hospital Integration,” *JAMA Internal Medicine*, 175(7), 2015, pp. 1229-1231; MedPAC, 2013, *op. cit.*

30. Second, prices differ by whether the health care provider is in-network or out-of-network for the patient's insurance plan. In commercial health insurance, physicians and hospitals can command higher commercial prices when they deliver care as out-of-network providers than when they deliver care as in-network providers.<sup>45</sup> This markup can be substantial for patients and families.<sup>46</sup> Why do networks exist? Health insurance companies create provider networks to enhance their bargaining power relative to physicians and hospitals and to steer their enrollees to lower cost or higher quality providers.<sup>47</sup> Enrollees are typically encouraged to go to in-network physicians and hospitals with incentives such as lower cost-sharing. Enrollees are frequently discouraged from going to out-of-network physicians and hospitals through the disincentive of higher cost-sharing. Thus, by negotiating for in-network prices with insurers, providers gain easier access to a group of in-network enrollees—who are potential patients—upon agreeing to be included in an insurance plan's network. By staying out of an insurance plan's network,

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<sup>45</sup> See, for example, Z. Cooper, *et al.*, "Out-Of-Network Billing And Negotiated Payments For Hospital-Based Physicians," *Health Affairs*, 39(1), 2020, pp. 24-32; Z. Cooper and F. Morton, "Out-of-Network Emergency-Physician Bills—An Unwelcome Surprise," *New England Journal of Medicine*, 375(20), 2016, pp. 1915-1918; N. Benson and Z. Song, "Prices and Cost Sharing for Psychotherapy In Network Versus Out Of Network in the United States," *Health Affairs*, 39(7), 2020, pp. 1210-1218; W. Johnson, *et al.*, "Out-of-Network Spending: Why Growing Attention Is Focused on a Small Share of Medical Spending," *Health Affairs Blog*, June 2, 2020 (<https://www.healthaffairs.org/doi/10.1377/hblog20200601.723677/full/>); Z. Song, *et al.*, "Out-of-Network Spending on Behavioral Health, 2008–2016," *Journal of General Internal Medicine*, 36(1), 2020, pp. 232-234; A.P. Sen, *et al.*, "Frequency and Costs of Out-of-Network Bills for Outpatient Laboratory Services Among Privately Insured Patients," *JAMA Internal Medicine*, 181(6), 2021, pp. 834-841.

<sup>46</sup> Z. Cooper, F. Morton, and N. Shekita, "Surprise! Out-of-Network Billing for Emergency Care in the United States," *Journal of Political Economy*, 128(9), 2020, pp. 3626-3677; C. Garmon and B. Chartock, "One In Five Inpatient Emergency Department Cases May Lead To Surprise Bills," *Health Affairs*, 36(1), 2017, pp. 177-181; E. Rosenthal, "How the High Cost of Medical Care Is Affecting Americans," *The New York Times*, December 18, 2014 (<https://www.nytimes.com/interactive/2014/12/18/health/cost-of-health-care-poll.html>); E. Rosenthal, "Insured, but Not Covered," *The New York Times*, February 7, 2015 (<https://www.nytimes.com/2015/02/08/sunday-review/insured-but-not-covered.html>); T. Bernard, "Out of Network, Not by Choice, and Facing Huge Health Bills," *The New York Times*, October 18, 2013 (<https://www.nytimes.com/2013/10/19/your-money/out-of-network-not-by-choice-and-facing-huge-health-bills.html>); Massachusetts Health Policy Commission, "Out-of-network Billing in Massachusetts," November 1, 2017 (<https://www.mass.gov/doc/presentation-out-of-network-billing-in-massachusetts/download>); AHIP Center for Policy and Research, "Charges Billed by Out-of-Network Providers: Implications for Affordability," September 2015 ([https://www.ahip.org/wp-content/uploads/2015/09/OON\\_Report\\_11.3.16.pdf](https://www.ahip.org/wp-content/uploads/2015/09/OON_Report_11.3.16.pdf)).

<sup>47</sup> K. Ho and R. Lee, "Equilibrium Provider Networks: Bargaining and Exclusion in Health Care Markets," *American Economic Review*, 109(2), 2019, pp. 473-522 at p. 473; K. Ho and R. Lee, "Narrow Medical Provider Networks: Welfare Implications and Approaches to Market Design," *More Fair by Design: Design Responses to Inequality*, Vol. IV. Eds. S. Kominers and A. Teytelboym. Oxford: Oxford University Press, 2016 pp. 1-11.

physicians and hospitals may lose access to those patients. However, providers may also decide to stay out of network for strategic reasons. If physicians, hospitals, or other providers (such as independent laboratories) reject the in-network price or simply do not want to be in an insurance plan's network, they can deliver care outside of any insurer's network and bill a higher charge (since they are not bound by the negotiated in-network price). This, of course, could lead to a loss of potential customers if patients find the out-of-network charge too prohibitive (assuming the forthcoming charge is disclosed to them before they consume the service). However, if a provider is not concerned about losing patients and has the market power to attract patients, such as through reputation or being the sole provider in a certain geography and thus operating without market competition, then in a purely economic sense the revenue-maximizing strategy could be to stay out-of-network for all commercial insurers. Table 5 below, adapted from my published analysis using 2016 data within a large commercial and Medicare claims database, shows the Medicare price for the same 3 example services in Tables 2 and 3 above compared to the average in-network and out-of-network commercial price.<sup>48</sup> Across these examples, the out-of-network prices are substantially higher than the in-network prices.

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<sup>48</sup> Z. Song, "The Pricing of Care Under Medicare for All: Implications and Policy Choices," *opt. cit.*



**TABLE 5**  
**MEDICARE PRICES VS. IN-NETWORK AND OUT-OF-NETWORK COMMERCIAL PRICES, 2016**

Physician service (CPT code)	Medicare Price	Commercial Insurer Price			
		In-Network		Out-of-Network	
		Price	Ratio to Medicare	Price	Ratio to Medicare
Electrocardiogram (93010)	\$9	\$17	1.9	\$28	3.3
Mid-level office visit (99213)	\$73	\$80	1.1	\$100	1.4
High-level ED visit (99285)	\$175	\$442	2.5	\$686	3.9

Notes: Adapted from Z. Song, “The Pricing of Care Under Medicare for All: Implications and Policy Choices,” *Journal of the American Medical Association*, 322(5), 2019, pp. 395-396. Please note that the commercial prices reported in this study differ from the commercial prices estimated in Table 3 for these example services because this study calculated the prices in a large, convenience sample of commercially insured populations in the 2016 IBM MarketScan commercial claims database, one of the nation’s largest commercial insurer databases, whereas prices in Table 3 were estimated using the conversion factors derived from the Lopez, *et al.* (2020) meta-analysis. Despite the difference in prices, these commercial prices across the two Tables are all consistently greater than Medicare prices, and their gap with respect to Medicare prices are of a similar magnitude.

31. In summary, the price of a health care service differs *between* insurers, ranging from Medicaid prices, to Medicare prices, to commercial insurer prices. This is largely explained by Medicaid and Medicare being able to administratively set their prices without negotiation; in contrast, commercial insurers negotiate with providers over prices, which renders the relative difference in market power between the parties important in determining prices. Prices also differ *within* insurers, based on the site of care and whether a provider is in-network or out-of-network with respect to an individual’s insurance plan. Site of care is important for prices because some sites are paid a single aggregate fee, whereas other sites are paid a combination of a facility fee for the facility and a professional fee for the physician. Provider network status matters for prices because in-network physicians and hospitals negotiate in-network prices in exchange for easier access by a population of insured individuals, whereas out-of-network providers are not bound by in-network negotiated prices and can garner higher prices. These basic tenets of pricing offer the foundations for a common methodology to estimate health care spending from a medical



monitoring program. They also convey the fact that a population's insurer mix, site of care, and network status of providers are relevant parameters to consider in estimating spending.

#### **IV. COMMON METHODOLOGY FOR ESTIMATING SPENDING ON MEDICAL MONITORING**

##### **A. Medical Services in a Monitoring Program**

32. The first step toward estimating the health care spending associated with a monitoring program is to define the services in the monitoring program and the frequency with which they will be used in the monitoring program for a member of the monitoring class. For the purposes of this report, I assume in this section that the foundation of such a potential monitoring program could begin with the following services: a urinalysis on an annual basis, a complete blood count on an annual basis, an evaluation and management (office visit) on an annual basis, a low-dose computed tomography (CT) chest imaging test on an annual basis, an upper endoscopy every five years, and a screening colonoscopy every five years. I consider these an example of an initial core set of medical services that patients with an increased risk of cancer could benefit from, to which additional services that are deemed appropriate for this class of patients may be added.

33. The second step toward estimating spending is to determine the price of each service that would apply to different insurers. Table 6 below shows the published 2021 Medicare prices for the above services in the non-facility setting, alongside the estimated national average Medicaid prices and estimated national average commercial prices. To further specify a concrete example for each service, I selected a common CPT code for services that have multiple variations, each with its own multiple CPT code. For example, there are approximately 10 different types of urinalysis tests, each with its own CPT code; for the purposes of this report, I selected the fairly common CPT code 81001, which the 2021 Medicare Clinical Diagnostic Laboratory Fee Schedule defines as a "manual urinalysis test with examination using microscope, automated."

34. For laboratory services, for the purposes of this illustration, I assumed that Medicare prices published under the PAMA would equal commercial prices, given that Medicare prices are determined by the commercial prices reported to federal regulators as specified by PAMA.

35. For medical services, I used the national average ratio of commercial-to-Medicare prices of 1.43 for physician services from Figure 1 to estimate the commercial prices. This ratio may generate, on average, a *conservative* estimate of commercial prices because services delivered in hospital outpatient departments, as discussed above, would likely garner facility fees that adhere to the 2.64 average ratio of commercial-to-Medicare prices from Figure 1. Notably, endoscopies, colonoscopies, CT chest imaging, laboratory tests, and even office visits frequently occur in hospital outpatient departments. It would be possible to model the share of services delivered in different sites of care, including the freestanding office and hospital outpatient departments. It would also be straightforward to analogously calculate the estimated commercial prices in the hospital outpatient department setting using a higher RVU conversion factor (Figure 1).

36. Alternatively, commercial prices, rather than being estimated using a conversion factor informed by the peer-reviewed research evidence base, could be directly calculated using a large commercial insurer claims database that contains unit prices at the service level. Examples of such commercial insurer claims database databases include the Health Care Cost Institute data, the IBM MarketScan Commercial Claims and Encounters database, and the FairHealth database.

37. All Medicaid prices for services in the table were calculated using the 0.72 Medicaid-to-Medicare national average price ratio. Depending on the locations of Medicaid members in the class, more geographically granular estimates of Medicaid prices can be calculated using state-specific Medicaid-to-Medicare price ratios.<sup>49</sup> In theory, Medicaid claims data could also be used to directly calculate Medicaid prices, although data availability can be more challenging and the quality of the claims data may vary across states.

38. If an individual is uninsured, the patient would not fall into any of the three major insured population segments shown in the table. The uninsured patient could face provider charges (from the chargemaster) billed directly to the patient or charges net of any provider discounts for an uninsured person. Although data on provider charges are less systematically available, it would be possible to model the markup of provider charges from prices using published data.

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<sup>49</sup> Kaiser Family Foundation, “Medicaid-to-Medicare Fee Index” *op. cit.*

**TABLE 6**  
**2021 MEDICARE PRICES AND ESTIMATED MEDICAID AND COMMERCIAL PRICES**

Service (CPT code)	Medicare Price (\$)	Medicaid Price (\$)	Commercial Price (\$)
Urinalysis (81001)	3.17	2.28	3.17
Complete blood count (85025)	7.77	5.59	7.77
Office visit (99214)	131.20	94.46	187.62
Low-dose chest CT scan (71271) <sup>50</sup>	150.74	108.53	215.56
Upper endoscopy (43235)	311.60	224.35	445.59
Screening colonoscopy (G0121) <sup>51</sup>	357.31	257.26	510.95

Notes: Medicare prices for physician services are obtained from the Medicare Physician Fee Schedule, 2021 national average payment amounts for the non-facility setting (*i.e.*, freestanding physician office setting).<sup>52</sup> Medicare prices for laboratory services are obtained from the Clinical Laboratory Fee Schedule, 2021 quarter 1 posting.<sup>53</sup> Medicaid prices are estimated by using the national average Medicaid-to-Medicare physician fee ratio of 0.72.<sup>54</sup> Commercial prices are similarly estimated at the national average level by applying the ratio of 1.43 to Medicare prices. The specific CPT codes were selected because they are common CPTs in the category of services; they are used for illustrative purposes here. Prices reflect the sum of both the insurer share and patient cost-sharing per unit of a service.

<sup>50</sup> CMS, “Medicare HETS 270/271 - Reminder - HETS HCPCS Code Change Effective January 31, 2021,” (<https://www.cms.gov/research-statistics-data-and-systems/cms-information-technology/hetshelp/mcare-notification-archive/medicare-hets-270271-reminder-hets-hcpcs-code-change-effective-january-31-2021>). American College of Radiology, “Low-Dose CT Lung Cancer Screening FAQ” (<https://www.acr.org/Clinical-Resources/Lung-Cancer-Screening-Resources/FAQ>).

<sup>51</sup> CMS, “Changes to Claims Processing Instructions for Colorectal Cancer Screening Services,” December 17, 2001, (<https://www.cms.gov/Regulations-and-Guidance/Guidance/Transmittals/downloads/R1735B3.pdf>). American Society of Gastroenterology, “2018 CPT Changes” ([https://www.asge.org/docs/default-source/coding/colonoscopy\\_2018-coding-sheet.pdf](https://www.asge.org/docs/default-source/coding/colonoscopy_2018-coding-sheet.pdf)). American Gastroenterological Association, “What’s the right code to use for screening colonoscopy?” (<https://gastro.org/practice-guidance/reimbursement/coding-faq-screening-colonoscopy/>).

<sup>52</sup> CMS, “Medicare Physician Fee Schedule Lookup Tool,” *op. cit.*

<sup>53</sup> CMS, “Clinical Laboratory Fee Schedule Files” (<https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/ClinicalLabFeeSched/Clinical-Laboratory-Fee-Schedule-Files>).

<sup>54</sup> Kaiser Family Foundation, “Medicaid-to-Medicare Fee Index,” *op. cit.*; E. Lopez, *et al.*, *op. cit.*

## **B. Composition of the Patient Population in Monitoring**

39. The next step toward estimating spending for a monitoring program is to determine or estimate the size and composition of the patient population undergoing monitoring. This includes determining the insurer mix, site of care composition, and network status of the providers for the patient population. In addition, projecting future health care use requires assumptions about life expectancy and the development of medical conditions (e.g. cancer and other acute and chronic diseases) that may render the monitoring program less appropriate clinically. The prices in Table 6 provide a sense of spending in the initial years of a monitoring program, when the defined class of individuals would be more likely to be stable in its composition. To estimate spending during the remaining life cycle of the class of individuals, additional assumptions or parameters such as life expectancy (e.g., for patients with hypertension or congestive heart failure, as these are key diagnosis that would more likely be clinical indications for taking valsartan) would be needed.

40. As the time horizon of estimation lengthens, prices may also evolve due to regulation or market forces. The federally set Medicare prices have tended to be fairly stable in recent years. In contrast, commercial prices have grown rather quickly, in part due to continued consolidation among providers, both horizontal consolidation (hospitals with hospitals or physician groups with physician groups) and vertical consolidation (hospitals acquiring physicians).<sup>55</sup> After adjusting for inflation, 75% of the growth in commercial prices nationwide from 2014 to 2018 were explained by growth in prices, as opposed to growth in the quantities or volume of care.<sup>56</sup> Therefore, estimating spending on a monitoring program may reasonably include assumptions about the growth rate of commercial prices over time.

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<sup>55</sup> MedPac, “Report to the Congress: Medicare Payment Policy,” March 13, 2020 ([http://medpac.gov/docs/default-source/reports/mar20\\_entirereport\\_sec.pdf?sfvrsn=0](http://medpac.gov/docs/default-source/reports/mar20_entirereport_sec.pdf?sfvrsn=0)); R. Abelson, “When Hospitals Merge to Save Money, Patients Often Pay More,” *New York Times*, November 18, 2018 (<https://www.nytimes.com/2018/11/14/health/hospital-mergers-health-care-spending.html>); K. Schwartz, E. Lopez, M. Rae, and T. Newman, “What We Know About Provider Consolidation,” September 2, 2020 (<https://www.kff.org/health-costs/issue-brief/what-we-know-about-provider-consolidation/>); L. Dafny, K. Ho, and R. Lee, “The Price Effects of Cross-Market Hospital Mergers,” National Bureau of Economic Research Working Paper 22106, October 2018 (<https://doi.org/10.3386/w22106>).

<sup>56</sup> Health Care Cost Institute, “HCCI’s Health Care Cost and Utilization Reports,” February 2020 (<https://healthcostinstitute.org/annual-reports/2020-02-13-18-20-19>)

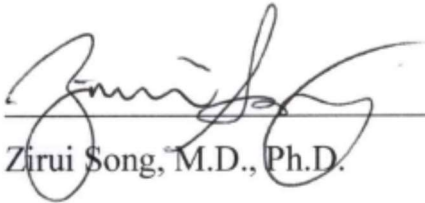
41. Over longer time horizons, insurance switching would also be more likely, namely people on commercial insurance before age 65 who age into Medicare at age 65. Consistent with the descriptive data shown in Table 5, additional empirical evidence has demonstrated that entering Medicare at age 65 reduces health care spending for outpatient services by about 30%, driven by a reduction in prices at the age 65 threshold from commercial down to Medicare levels, without significant changes in overall utilization.<sup>57</sup> Therefore, given the age distribution of the class members and their rate of entry into Medicare from commercial insurance at age 65, estimates of spending on a monitoring program may also reasonably take into account the reduction in prices from commercial to Medicare levels as individuals enter Medicare.

### **C. Calculating Spending**

42. In the class of patients in this case, the presumptive spending on a medical monitoring program can be calculated as the prices of health care services multiplied by the quantities of services determined to be in the monitoring program, applied to a population of people with a given health insurance mix, shares of services obtained at different sites of care, and shares of services delivered by in-network vs. out-of-network providers. Such a methodology would also be able to incorporate factors such as the expected number of years in the monitoring program, and rate of attrition from the monitoring program, and the contribution of market forces such as price inflation due to provider consolidation. Additional factors that affect prices or quantities of care may also be incorporated. The methodology described above would be applied in a common manner to all clinical services deemed to be in the monitoring program.

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<sup>57</sup> J. Wallace and Z. Song, “Traditional Medicare Versus Private Insurance: How Spending, Volume, and Price Change at Age Sixty-Five,” *Health Affairs*, 35(5), 2016, pp. 864-872.



Zirui Song, M.D., Ph.D.

November 10, 2021

**ATTACHMENT A**

**The Faculty of Medicine of Harvard University  
Curriculum Vitae**

**Date Prepared:** October 25, 2021  
**Name:** Zirui Song  
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**Education:**

9/2002–5/2006	B.A. with General and Departmental Honors	Major: Public Health Studies Minor: Economics	Johns Hopkins University
8/2006–5/2014	M.D., Magna Cum Laude	Medicine	Harvard Medical School
8/2008–5/2012	Ph.D.	Health Policy Economics concentration	Harvard University

**Postdoctoral Training:**

6/2014–6/2015	Internship	Internal Medicine, Primary Care	Massachusetts General Hospital
6/2015–6/2017	Residency	Internal Medicine, Primary Care	Massachusetts General Hospital

**Clinical and Research Fellowships:**

6/2010–5/2012	Pre-Doctoral Fellow	Fellowship in Aging and Health Economics	National Bureau of Economic Research
6/2012–5/2013	Post-Doctoral Fellow	Fellowship in Aging and Health Economics	National Bureau of Economic Research
6/2014–6/2017	Clinical Fellow	Medicine	Harvard Medical School

**Faculty Academic Appointments:**

7/2017–	Assistant Professor	Health Care Policy	Harvard Medical School
7/2018–	Assistant Professor	Medicine	Harvard Medical School
9/2021–	Associate Professor	Health Care Policy	Harvard Medical School

**Appointments at Hospitals/Affiliated Institutions:**

8/2017–5/2020	Assistant in Medicine	Medicine (DGIM)	Massachusetts General Hospital
5/2020–	Assistant Physician	Medicine (DGIM)	Massachusetts General Hospital

**Other Professional Positions:**



2004–2006	Intern (2004-05), Special Guest (2005-06) Center on Social and Economic Dynamics	The Brookings Institution, Washington, DC
2005–2006	Clinical Research Fellow, Department of Medicine	Union Memorial Hospital, Baltimore, MD
2015	Analyst/Advisor, Medicare Advantage payment policy Office of Health Policy, Office of the Assistant Secretary for Planning and Evaluation (Jul-Aug)	U.S. Department of Health and Human Services
2015–2016	Visiting Fellow, Accountable Care, Health Policy Commission	Commonwealth of Massachusetts
2016	Visiting Scholar, Dartmouth Institute for Health Policy and Clinical Practice (Aug-Sep)	Geisel School of Medicine, Dartmouth College
2016	Visiting Scholar, Leonard Davis Institute of Health Economics and Department of Medical Ethics and Health Policy (Oct-Nov)	Perelman School of Medicine, University of Pennsylvania
2017–	Faculty Affiliate, Center for Primary Care	Harvard Medical School

#### **Administrative Leadership Positions:**

##### **Local**

2003–2005	Founder and Editor-in-Chief, Epidemic Proportions: Johns Hopkins Undergraduate Public Health Journal	Johns Hopkins University
2005–2006	President, Alpha Epsilon Delta: Johns Hopkins Pre- Medical Honor Society	Johns Hopkins University
2008–2012	Resident Tutor, Pre-Medicine Committee	Cabot House, Harvard College
2010–2011	Co-President, Harvard University Student Chapter	AcademyHealth
2013–2014	Co-Chair, Student Leadership Committee	Center for Primary Care, Harvard Medical School
2018–	Co-Director, Evidence, Insight and Strategy for Optimizing Health Benefits Course	Harvard Medical School Office for External Education
2018–	Co-Director, Mass General Brigham Centers of Expertise Health Policy Course	Mass General Brigham
2021–	Co-Director, Essentials of the Profession (EOP) 1— Health Policy Course	Harvard Medical School
2021–	Director, Health Policy Concentration, Internal Medicine Residency Program	Department of Medicine, Massachusetts General Hospital

#### **Committee Service:**

##### **Local**

2011–2014	Student Steering Committee, MD-PhD Program	Harvard Medical School
2014–2015	Community Advisory Board, Center for Primary Care	Harvard Medical School
2015–2016	Leadership Council, The Family Van	Harvard Medical School
2015–2017	Representative of the Department of Medicine, Trainee Quality and Safety Committee (2-year term)	Massachusetts General Hospital

2016–2017	Resident Co-Leader, Department of Medicine Resident Quality and Safety Committee	Massachusetts General Hospital
2016–2017	Resident Co-Leader, Department of Medicine Resident Leadership Curriculum	Massachusetts General Hospital
2017–	Committee on Higher Degrees in Health Policy	Harvard University
2018–2019	Finance Committee, Internal Medicine Associates	Massachusetts General Hospital
2018–	Standing Committee on Health Policy	Ph.D. Program in Health Policy Harvard University
2021–	Diversity, Equity, and Inclusion Scholarship and Research Committee	Harvard Medical School

### **Regional**

2009–2012	Committee on Publications	Massachusetts Medical Society
2010–2012	Task Force on Health Care Reform	Massachusetts Medical Society
2010–2015	Boston Advisory Board	Albert Schweitzer Fellowship

### **National**

2015	Technical Expert Panel: “Improving Medicare Advantage Benchmarks,” Office of the Assistant Secretary for Planning and Evaluation	U.S. Department of Health and Human Services
2016	Payment Transformation Blue Ribbon Panel	Hawaii Medical Service Association
2020	Technical Expert Panel	Health Care Cost Institute
2020–2021	Co-chair, Scientific Abstract Committee	Society of General Internal Medicine
2021	Technical Expert Panel	American Board of Family Medicine
2021–2022	Chair, Scientific Abstract Committee	Society of General Internal Medicine
2021–	Transforming Health Care to Create Whole Health: Strategies to Assess, Scale, and Spread the Whole Person Approach to Health	National Academies of Sciences, Engineering, and Medicine

### **Professional Societies:**

2008–	Massachusetts Medical Society
2009–	American Society of Health Economists
2011–	AcademyHealth
2014–2015	American College of Physicians
2014–	Society of General Internal Medicine
2018–	American Economic Association

### **Grant Review Activities:**

2016	NIA-S: Standing Committee on Behavioral and Social Science of Aging (Ad hoc Grant Reviewer)	National Institute on Aging, National Institutes of Health
2018	Scientific review panel (Ad hoc Grant Reviewer)	National Institute on Aging,

National Institutes of Health

**Other Review Activities:**

2014	Abstract Reviewer, Annual Research Meeting	AcademyHealth
2015–2016	Student Poster Abstract Committee	AcademyHealth
2019	Abstract Reviewer, 25th Annual National Research Service Award (NRSA) Trainees Research Conference	Agency for Healthcare Research and Quality (AHRQ)
2021	Medicare Payment Advisory Commission Report	MedPAC

**Editorial Activities:**

**Ad hoc Reviewer**

Academic Medicine  
American Economic Review  
American Journal of Epidemiology  
American Journal of Managed Care  
Annals of Internal Medicine  
British Medical Journal  
Circulation  
Circulation: Cardiovascular Quality and Outcomes  
Forum for Health Economics & Policy  
Health Affairs  
Health Economics  
Health Services and Outcomes Research Methodology  
Health Services Research  
Healthcare  
Inquiry  
International Journal of Health Care Finance and Economics  
JAMA Internal Medicine  
JAMA Health Forum  
Journal of Clinical Oncology  
Journal of General Internal Medicine  
Journal of Health Economics  
Journal of Human Resources  
Journal of Public Economics  
Journal of the American Medical Association  
Lancet Public Health  
Management Science  
Medical Care Research and Review  
Milbank Quarterly  
New England Journal of Medicine  
PLOS Medicine  
Psychiatric Services

**Other Editorial Roles**

2013–2017	Editor, Payment Reform	Healthcare
2013–2018	Associate Editor	Healthcare
2017–2018	Guest Editor	Inquiry (Special Collection on Medicare Advantage)
2017–	Editorial Board	PLOS Medicine

# **Honors and Awards:**

2002–2006	Woodrow Wilson Research Fellowship	Johns Hopkins University
2005	Finalist, Rhodes Scholarship	District XV, United States
2005–2006	Suzy Bacon Fellowship (Honorary)	Johns Hopkins University
2006	Outstanding Achievement in Public Health	Johns Hopkins University
2007	Edward Hickling Bradford Research Fellowship	Harvard Medical School
2007	PASTEUR Research Fellowship	Harvard Medical School
2009–2011	Certificate of Distinction in Teaching 2009: Advanced Topics in Health Policy (GOV 1597) 2010: Advanced Topics in Health Policy (GOV 1597) 2011: Advanced Topics in Global Health and Health Policy (GHHP 99)	Harvard University
2010	Top 10 Papers Published in 2010	Health Affairs
2010–2011	Excellence in Tutorial Facilitation Award 2010: Introduction to Health Care Policy (HC.750) 2011: Introduction to Health Care Policy (HC.750)	Harvard Medical School
2011	Best Abstract, Most Outstanding Abstract, “Health Reform Implementation” category	AcademyHealth Annual Research Meeting, Seattle
2011	First place, Health Policy/Medical Education Sixth Annual Research Poster Symposium	Massachusetts Medical Society
2011	Honorable Mention Award, Innovations Conference	Center for Primary Care Harvard Medical School
2012	Best Abstract, Most Outstanding Abstract, “Delivery System Innovations” category	AcademyHealth Annual Research Meeting, Orlando
2012	Finalist, 18th Annual Health Care Research Award	National Institute for Health Care Management Foundation
2012	Joan P. Curhan Citizenship Award	Harvard University
2013	Article-of-the-Year Award	AcademyHealth
2014	Honors in a Special Field (Magna): Health Economics and Health Policy	Committee on Awards & Honors Harvard Medical School
2014	Rose Seegal Prize (“Best research paper on the relation of the medical profession to the community”)	Faculty of Medicine Harvard Medical School
2014	Best Abstract Award (Residents) 12th Annual Celebration of Clinical Research	Department of Medicine, Massachusetts General Hospital
2014	Daniel Ford Award (“Achievement in health services and outcomes research”), General Internal Medicine Housestaff Research Awards	Division of General Internal Medicine, Johns Hopkins Medicine
2014	First Place, Oral Presentation Resident Research Category	Massachusetts Chapter, American College of Physicians
2015	National Winner, “High Value Care” category Resident/Fellow Research Poster Competition	Internal Medicine 2015, American College of Physicians

2015	Morton N. Swartz, M.D. Humanism in Medicine Award Selected by peers for “Joy in the practice of medicine and kindness to others”	Department of Medicine, Massachusetts General Hospital
2015	Hospital-Wide Individual Research Award	Massachusetts General Hospital
2016	Mack Lipkin Sr. Associate Member Scientific Presentation Award	Society of General Internal Medicine
2016	Seema S. Sonnad Emerging Leader in Managed Care Research Award	The American Journal of Managed Care
2017	Award for Excellence in Clinician Investigation	Society of General Internal Medicine, New England Region
2018	Most-Shared Health Affairs Articles of 2017	Health Affairs
2018	HCUP Outstanding Article of the Year – Honorable Mention	AHRQ and AcademyHealth
2018	Ten Influential Studies in Health Services Research	National Academy of Medicine
2019	Milton W. Hamolsky Jr. Faculty Scientific Presentation Award	Society of General Internal Medicine
2019	Bernie J. O'Brien New Investigator Award	International Society for Pharmacoeconomics and Outcomes Research
2019	Best Abstract, “Payment and Delivery System Innovations” category	AcademyHealth Annual Research Meeting, Washington
2020	Outstanding Reviewer in 2019	Health Services Research
2020	Outstanding Junior Investigator of the Year	Society of General Internal Medicine
2020	NIHCM Foundation Health Care Research Award	National Institute for Health Care Management Foundation
2020	Best Abstracts, “Addressing Consumer and Patients’ Preferences and Needs” category and “Payment and Delivery Systems Innovations” category	AcademyHealth Annual Research Meeting

## **Report of Funded and Unfunded Projects**

### **Past**

2011–2014	Provider Payment Reform and Implications for Health Care Costs National Institute on Aging (F30 AG039175) Principal Investigator
2014–2016	Impact of Payment Reform on Physician Referrals, Patient Flows and Health Care Costs National Institute for Health Care Management Foundation Co-investigator (PI: Bruce Landon)
2014–2017	“The Impact of Employee Wellness Programs: A Randomized Controlled Trial” Jameel Poverty Action Lab – North America Co-investigator (PI: Katherine Baicker)
2015–2018	“The Impact of Employee Wellness Programs: A Randomized Controlled Trial” Robert Wood Johnson Foundation (72611) Co-Project Director (with Katherine Baicker)

2017–2020 HealthCare Markets and Regulation Lab, Harvard Medical School  
Laura and John Arnold Foundation  
Co-investigator (PI: Michael Chernew)

2016–2021 “The Impact of Employee Wellness Programs”  
NIH/National Institute on Aging (R01 AG050329)  
Principal Investigator 2018–2021 (Katherine Baicker 2016–2018)

#### **Current**

2017–2022 “Inequities in Health Outcomes in the Twenty-First Century: Understanding New Causes and the Impact of Delivery System Reforms on Health Care Disparities”  
Office of the Director, National Institutes of Health (DP5 OD 024564)  
Principal Investigator (NIH Director's Early Independence Award)

2020-2021 “Measuring the Clinical and Economic Outcomes Associated with Delivery Systems”  
Agency for Healthcare Research and Quality via NBER (U19HS024072, supplement)  
Co-investigator (PI: David Cutler)

2020–2023 HealthCare Markets and Regulation Lab, Harvard Medical School  
Laura and John Arnold Foundation (Grant ID: 20-04402)  
Principal Investigator of Subproject (PI: Michael Chernew)

2021– “Private Equity Acquisitions of Physician Medical Practices and Implications for Practice Patterns and Costs of Care,” National Institute for Health Care Management Foundation  
Co-investigator (PI: Jane Zhu)

2021– “Improving Medicare in an Era of Change”  
NIH/National Institute on Aging (P01 AG032952)  
Co-Investigator (PI: McWilliams/Landon)

#### **Training Grants and Mentored Trainee Grants**

2008–2009 Harvard University Ph.D. Program in Health Policy Training Grant  
Agency for Healthcare Research and Quality (T32 HS000055)  
Trainee (PI: Joseph Newhouse)

2009–2010 Harvard Medical School/Harvard University Walker Grant  
Harvard University PhD Program in Health Policy  
Trainee (PI: Joseph Newhouse)

2010–2011 Pre-doctoral Fellowship in Aging and Health Economics  
National Institute on Aging via NBER (T32 AG000186)  
Pre-doctoral Fellow (PI: David Wise)

#### **Report of Local Teaching and Training**

##### **Teaching of Students in Courses:**

2009–2010	Advanced Topics in Health Policy Co-Instructor, undergraduates	Harvard College 1-2 2-hour classes/week, 13 weeks
2011 Spring	Advanced Topics in Global Health and Health Policy, Co-Instructor, undergraduates	Harvard College 1 2-hour class/week, 13 weeks
2009–2015	Introduction to Health Care Policy, medical and dental medicine students 2009–2011: Head Teaching Fellow 2009–2010, 2014: Tutorial leader 2011–2015: Guest lecturer	Harvard Medical School and Harvard School of Dental Medicine 3 1-hour classes/week, 4 weeks 1 2-hour lecture/year



2015 Aug	Economics for Health Policy, Guest lecturer, Master's degree students	Harvard T.H. Chan School of Public Health, 2-hour lecture
2016 Nov	Health Care Management & Strategy, Guest lecturer, undergraduate students	Wharton School, Univ of Pennsylvania 1.5-hour lecture
2016 Fall	Health Care Systems, Guest lecturer, undergraduate students	Wharton School, Univ of Pennsylvania 2 1.5-hour lectures
2017–	Research in Health Economics, Guest lecturer, doctoral students	Harvard Kennedy School 1.5-hour lecture per year
2018 Aug	Economics for Health Policy, Guest lecturer, Master's degree students	Harvard T.H. Chan School of Public Health, 2-hour lecture
2018–	Evidence, Insight and Strategy for Optimizing Health Benefits, U.S. employers	Harvard Medical School Office for External Education, 3 days per year
2018–	MIT HMS Healthcare Innovation Bootcamp (students from 30+ countries), Guest lecturer	MIT and Harvard Medical School, 1-2 hour lecture per year
2018–	Core Course in Health Policy, Guest lecturer and Quality section leader (2020), doctoral students	Harvard University 1 to 2 2-hour lectures per year
2019–	Essentials of the Profession 1—Health Policy, Tutorial leader, medical and dental medicine students	Harvard Medical School and Harvard School of Dental Medicine 2 hours per week, 4 weeks per year
2019 Nov	U.S. Healthcare Industry and Regulatory Policy, Guest lecturer, graduate students	Harvard Kennedy School 1-hour lecture
2020–	Health Care Quality in America, Guest lecturer, Undergraduate students	Harvard College 1-hour lecture per year
2020–	Essentials of the Profession 2—Health Policy, Guest lecturer, medical and dental students	Harvard Medical School 2 1-hour lectures per year
2020–	Economics of Health Care—Public vs. Market Solutions, Guest lecturer	Harvard T.H. Chan School of Public Health, 1-hour lecture per year
2020–	HealthTech Fellowship Bootcamp, Guest lecturer	Harvard Medical School, 1-2 hour lecture per year
2020 July	MD-PhD Summer Course for entering students, Guest lecturer	Harvard Medical School 2 1-hour classes
2020 Nov	Confronting COVID-19: Future of Healthcare Policy and Healthcare Delivery, Guest lecturer	Harvard College 1-hour panel discussion

### **Formal Teaching of Residents, Clinical Fellows and Research Fellows (post-docs):**

2015–	Department of Medicine Noon Conference on health policy, residents (PGY 1-3) and faculty	Massachusetts General Hospital 1-2 1-hour lectures per year
2015–2016	Department of Medicine Ambulatory Care Curriculum, residents (PGY 2-3)	Massachusetts General Hospital 4 1-hour lectures
2017–	Mass General Brigham Centers of Expertise Health Policy Course, residents and fellows across specialties (PGY 1-9)	Mass General Brigham, Boston, MA 1 week per year, 3-5 hours of lecture and discussion per year
2017 Mar	"Current Issues in Health Policy," Department of Psychiatry, residents (PGY 3-4)	McLean Hospital 1-hour lecture

2017–	Department of Psychiatry Community Psychiatry Curriculum, residents (PGY 1-4)	Massachusetts General Hospital 2-5 hours of lectures per year
2017–	Department of Medicine Global Medicine Curriculum, interns (PGY 1)	Massachusetts General Hospital 1-hour lecture per year
2018–	Department of Psychiatry Child Psychiatry Fellowship Journal Club	Massachusetts General Hospital 1-hour lecture (seminar) per year
2019–	Department of Medicine Management Leadership curriculum, residents (PGY 1-3)	Brigham and Women’s Hospital 1-hour lecture per year
2020–	MGH/McLean Adult Psychiatry Residency noon conferences	Massachusetts General Hospital 1-2.5 hours per year
2021–	Health Policy Course, Department of Medicine Health Policy Concentration	Massachusetts General Hospital 4 3-hour sessions per year

#### **Clinical Supervisory and Training Responsibilities:**

2018–	Inpatient attending physician on the Bigelow house staff teaching service	Massachusetts General Hospital 4 weeks per year
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#### **Laboratory and Other Research Supervisory and Training Responsibilities:**

2017–	Supervision of doctoral student research and training, Harvard Medical School	2 hour meetings per month and 1:1 supervision 2 hours per month
2017–	Supervision of research assistants training and protocol, Harvard Medical School	1 hour meeting per week and 1:1 supervision 1 hour per week
2018–2019	Supervision of summer students research and training, Harvard Medical School	1 hour meeting per week and 1:1 supervision 1 hour per week

#### **Formally Mentored Harvard Medical, Dental, and Graduate Students:**

2017–	<p>Suhas Gondi, M.D./M.B.A. candidate, Harvard Medical School and Harvard Business School; Foster Scholar in Health Policy, Advocacy, and Media, Stoeckle Center for Primary Care Innovation, Massachusetts General Hospital</p> <ul style="list-style-type: none"> <li>• Mentoring role: research advisor and collaborator</li> <li>• Papers: <a href="#">Health Affairs Blog</a> (2019), <a href="#">JAMA</a> (2019, 2019), <a href="#">AJMC</a> (2019), <a href="#">JAMA IM</a> (2020), <a href="#">JAMA Health Forum</a> (2021, 2021)</li> </ul>	
2018–	<p>Yunan Ji, Ph.D. candidate in Health Policy, Harvard University</p> <ul style="list-style-type: none"> <li>• Mentoring role: research advisor and collaborator</li> <li>• Paper: <a href="#">NEJM</a> (2019)</li> </ul>	
2018–	<p>Mubeen Shakir, M.Sc., M.D. (2019), Harvard Medical School</p> <ul style="list-style-type: none"> <li>• Mentoring role: research advisor for HMS scholarly project (thesis) “Differences in Health and Health Care between Rural and Urban America,” which was awarded the HMS Leon Eisenberg Prize for Medicine in Society Research (2019)</li> </ul>	
2018–	<p>Joseph Bruch, Ph.D. (2021), Harvard School of Public Health</p> <ul style="list-style-type: none"> <li>• Mentoring role: chair, dissertation committee</li> </ul>	



- Papers: JAMA Internal Medicine (2020, 2020), Annals of Internal Medicine (2020), JAMA Health Forum (2021), American Journal of Public Health (2021)

2018– Jason Buxbaum, Ph.D. candidate in Health Policy, Harvard University  
 • Mentoring role: research advisor

2019– Shivani Shah, M.D. candidate, Harvard Medical School  
 • Mentoring role: research advisor  
 • Papers: JAMA Health Forum (2020), JGIM (2021)

2020– Garret Johnson, M.D. (2021), Harvard Medical School  
 • Mentoring role: HMS scholarly project mentor

#### **Other Mentored Trainees and Faculty:**

2013–2017 Andrew P. Loehrer, M.D., M.P.H.  
 Assistant Professor of Surgery, Geisel School of Medicine, Dartmouth; formerly Clinical Fellow in Complex General Surgical Oncology, MD Anderson Cancer Center; David Torchiana Fellow in Health Policy & Management, MGH  
 • Mentoring role: research advisor and collaborator  
 • Papers: JAMA Surgery (2013, 2017), Annals of Surgery (2015, 2016), Journal of the American College of Surgeons (2015), Journal of Clinical Oncology (2016), and Journal of Oncology Practice (2017)

2014–2015 John W. Scott, M.D., M.P.H.  
 Assistant Professor, University of Michigan; formerly Fellow, Harborview Medical Center; Henry Ellis Warren Research Fellow, Center for Surgery and Public Health, BWH; Brigham and Women's Hospital and Harvard Medical School  
 • Mentoring role: research advisor and collaborator  
 • Papers: Health Affairs (2015), Journal of the American College of Surgeons (2015)

2018 Summer Carol Tao, B.A. candidate, New York University  
 • Mentoring role: research advisor

2018 Summer William Tian, M.D. candidate, University of Illinois College of Medicine  
 • Mentoring role: research advisor

2018–2019 Cian P. McCarthy, M.B., B.Ch., B.A.O.  
 Internal Medicine resident, Massachusetts General Hospital  
 • Mentoring role: research advisor and collaborator  
 • Papers: Journal of the American College of Cardiology (2018), Circulation (2018)

2018–2019 Arielle Elmaleh-Sachs, M.D.  
 Internal Medicine resident, Massachusetts General Hospital  
 • Mentoring role: research advisor

2018– Sneha Kannan, M.D.  
 Internal Medicine resident, Pulm/Crit Care fellow, Massachusetts General Hospital  
 • Mentoring role: research advisor and collaborator  
 • 1 manuscript under peer review

2018– Samuel J. Enumah, M.D.

General Surgery resident, Brigham and Women's Hospital; Association for Academic Surgery/Association for Academic Surgery Foundation Trainee Research Fellow in Clinical Outcomes, Education & Health Services; Harvard T-32 Trainee

- Mentoring role: research advisor and collaborator
- 1 manuscript under peer review

2018– Nicole Benson, M.D.  
Fellow in Child and Adolescent Psychiatry, Massachusetts General Hospital

- Mentoring role: research advisor and collaborator
- Papers: JGIM (2020), Health Affairs (2020), JGIM (2021)

2018– Thomas Roberts, M.D., M.B.A.  
Internal Medicine resident (MGH), Oncology fellow, Dana Farber Cancer Institute

- Mentoring role: research advisor and collaborator
- 1 manuscript under peer review

2019 Summer Neeti Kulkarni, B.A. candidate, Brandeis University

- Mentoring role: research advisor and collaborator

2019– Lindsey J. Patterson, Ph.D.  
Marshall J. Seidman Fellow, Harvard Medical School

- Mentoring role: research advisor and collaborator
- 1 manuscript under peer review

### **Report of Local Invited Presentations:**

#### ***No presentations below were sponsored by outside entities***

4/2006	"Smoking and Obesity: The Public Health Crises of Our Generation" Woodrow Wilson Fellowship Ceremony, Johns Hopkins University, Baltimore, MD
7/2012	"Next Steps in Health Care Reform: Transitioning to Accountable Care" Principal Clinical Experience Intersession, Harvard Medical School, Boston, MA
7/2012	"Early Experience with Accountable Care in Massachusetts" Meet the Expert Seminar Series, Harvard School of Public Health, Boston, MA
9/2013	"Clinical Decision-Making and Health Care Spending" MD-PhD/LHB Grand Rounds, Harvard Medical School, Boston, MA
10/2013	"Improving the Value of American Health Care: Policy Options" 31th Annual Retreat, MD-PhD Program, Harvard Medical School, Boston, MA
10/2015	"Health Care Spending and Quality Under Global Payment," Netherlands Delegation, Harvard T.H. Chan School of Public Health, Boston, MA
12/2013	"Slowing the Growth of Health Care Spending" Health Policy Seminar, Tufts Medical Center, Boston, MA
2/2016	"Strategies for Slowing Health Care Spending," Harvard T.H. Chan School of Public Health, Boston, MA
10/2016	"Strategies to Slow the Growth of Health Care Spending" Department of Health Care Policy, Harvard Medical School, Boston, MA
10/2016	"Strategies to Slow Health Care Spending," Division of General Internal Medicine, Massachusetts General Hospital, Boston, MA

- 2/2017 "Health Care and the Affordable Care Act after the Election," Department of Psychiatry, Massachusetts General Hospital, Boston, MA
- 5/2017 "The Changing Mortality and Composition of Opioid-Related Hospitalizations Versus Other Hospitalizations in the United States," Division of General Internal Medicine Medical Rounds Conference, Massachusetts General Hospital, Boston, MA
- 9/2017 "The Impact of Workplace Wellness Programs on Health and Economic Outcomes," Harvard School of Public Health, Boston, MA
- 10/2017 "Health Care Policy in 2020," Primary Care in 2020 Conference, Center for Primary Care, Harvard Medical School, Boston, MA
- 2/2018 "Policies to Address Health Care Spending and Value," Health Policy and Insurance Research Seminar, Department of Population Medicine, Harvard Medical School and Harvard Pilgrim Health Care Institute, Boston, MA
- 3/2018 "Fixing Prices or Price Fixing? Physician Responses to New Payments for Heart Disease Treatments," HCP Health Economics Seminar, Harvard Medical School, Boston, MA
- 5/2018 "A Guide to Research in Health Policy," Medical Directors' Meeting, Population Health Management, Partners Healthcare, Boston, MA
- 6/2018 "The Impact of Changes in Medicare Physician and Hospital Outpatient Fees," Division of General Internal Medicine, Massachusetts General Hospital, Boston, MA
- 7/2018 "The Impact of Medicare PCI Fee Changes on Provider Behavior," Smith Center for Outcomes Research in Cardiology, Beth Israel Deaconess Medical Center, Boston, MA
- 9/2018 "Meet the Investigator" Seminar, MD-PhD Program, Harvard Medical School, Boston, MA
- 10/2018 "Impact of Workplace Wellness on Health and Economic Outcomes: A Randomized Controlled Trial," HCP Health Economics Seminar, Harvard Medical School, Boston, MA
- 4/2019 "The Impact of Changes in Medicare Prices for PCI," Cath Conference, Massachusetts General Hospital, Boston, MA
- 4/2019 "Changes in Economic and Clinical Outcomes Under CMS Mandatory Bundled Payments for Joint Replacements," Division of General Internal Medicine, Massachusetts General Hospital, Boston, MA
- 5/2019 "Impact of Workplace Wellness on Health and Economic Outcomes: A Randomized Controlled Trial," Division of General Internal Medicine Medical Rounds Conference, Massachusetts General Hospital, Boston, MA
- 6/2019 "Health Care: An Endangered Species?" Alumni Day Symposium, Harvard Medical School
- 6/2019 "Policy Options to Address Health Care Spending," Center for Primary Care, Harvard Medical School, Boston, MA
- 9/2019 "Health Care Spending and Quality 8 Years into Global Payment," Healthcare Markets & Regulations Lab Industry Working Group Summit, Harvard Medical School, Boston, MA
- 11/2019 "Improving the Value of Health Care," 45th Anniversary Reunion and Celebration Harvard/MIT Medical Scientist Training Program, Harvard Medical School, Boston, MA

### **Report of Regional, National, and International Invited Teaching and Presentations**

***No presentations below were sponsored by outside entities***

#### **Regional**

- 10/2009 "Health Care Reform and the Social Sciences," 27th Annual Student Faculty Retreat, MD-PhD Program, Harvard Medical School, Waterville Valley, NH

3/2011 "Health Care Reform," Boston University School of Medicine, Boston, MA

8/2011 "Effect of the AQC on Health Care Spending and Quality"  
Massachusetts Health Care Quality and Cost Council, Boston, MA

1/2012 "A Primer on Health Care Reform," Albert Schweitzer Fellowship,  
Boston Fellows Meeting, Boston, MA

2/2012 "Changing Paradigms in Healthcare: What Does the Future Hold?"  
Massachusetts Medical Society Physician Leadership Institute, Boston, MA

4/2012 "Year-2 Evaluation of the Alternative Quality Contract"  
The Dartmouth Institute for Health Policy and Clinical Practice, Lebanon, NH

6/2013 "The Return-on-Investment of Wellness: Evidence and Policy"  
New England Employee Benefits Council, Waltham, MA

12/2013 "Slowing the Growth of Health Care Spending"  
Health Policy Seminar, Tufts Medical Center, Boston, MA

4/2014 "Payment Reform in Massachusetts: Early Evidence on Spending and Quality,"  
Dartmouth Symposium in Health Care Delivery Science, Hanover, NH

7/2014 "Program Evaluation and ROI: Evidence and Policy"  
Best Practices in Worksite Wellness Conference, Braintree, MA

11/2014 "Health Care Spending and Quality 4 Years into Global Payment for ACOs" (selected  
abstract), American College of Physicians Annual Scientific Meeting, Waltham, MA

3/2015 "Medicare Fee Cuts and Physician-Hospital Integration" (selected abstract),  
New England Society of General Internal Medicine (SGIM) Regional Meeting, Boston, MA

4/2015 "The Emergence of Worksite Wellness in Health Policy"  
The Business of Worksite Wellness and Nutrition Conference, Rockland, MA

10/2015 "Evaluations of Public and Private Strategies for Improving the Value of Health Care  
Spending," Health Policy Commission, Boston, MA

3/2016 "Changes in Quality and Spending for High versus Low Socioeconomic Status Populations  
Under Global Payment" (selected abstract), New England Society of General Internal  
Medicine (SGIM) Meeting, New Haven, CT (Plenary speaker)

4/2016 "Improving the Evidence Base on Worksite Wellness"  
Third Annual Emerging Trends in Wellness Conference, Randolph, MA

5/2016 "Mortality Among Opioid-Related vs. Other Hospitalizations in the U.S.," Health Policy  
Commission, Boston, MA.

3/2017 "Mortality and Composition of Opioid Hospitalizations in the United States" (selected  
abstract), New England Society of General Internal Medicine (SGIM) Meeting, Boston, MA

4/2017 "Changes in Quality of Care and Medical Spending for High versus Low Socioeconomic  
Status Populations under Global Payment," Health Policy Commission, Boston, MA

4/2017 "An Update on the Evidence Base for Workplace Wellness," Fourth Annual Emerging  
Trends in Wellness Conference, Randolph, MA

3/2018 "Policies to Address Health Care Spending," Health Policy Seminar, Institute for Clinical  
Research and Health Policy Studies, Tufts Medical Center, Boston, MA

4/2018 "Impact of Workplace Wellness on Health and Economic Outcomes," Fifth Annual  
Emerging Trends in Wellness Conference, Randolph, MA

2/2019 "Current State of Health Care Policy in the United States," Whitney Center, Hamden, CT

- 2/2019 “ACOs in Massachusetts: the AQC Experience,” MassHealth, Executive Office of Health and Human Services, Commonwealth of Massachusetts
- 3/2019 “Physician Scientists and the Health Care Economy,” (Clinical and Population Health Keynote), University of Massachusetts Medical School, MD/PhD Program | Medical Scientist Training Program, 14th Annual Physician-Scientist Retreat, Worcester, MA
- 1/2021 “Peer Effects and Health Care Consumption: Evidence from Spousal Health Shocks,” Columbia University Mailman School of Public Health (virtual)
- 3/2021 “Payment for Primary Care,” Health Care Delivery Transformation Conference, Healthcare Financial Management Association, Massachusetts-Rhode Island Chapter (virtual)

**National**

- 12/2005 “Undergraduate public health education: Role of the student-run publication” (selected abstract), American Public Health Association Meeting, Philadelphia, PA
- 11/2009 “The Albert Schweitzer Fellowship,” PRI-MED Conference, Boston, MA
- 6/2010 “Using the Dartmouth Atlas” (selected abstract), AcademyHealth Annual Research Meeting, Boston, MA
- 8/2010 “Health Care Reform 2010: Policies and Objectives,” Carolinas Medical Center, Concord, NC
- 10/2010 “Health Care Reform 2010: Policies and Objectives,” 4th Annual Albert Schweitzer Fellowship Conference, Baltimore, MD
- 6/2011 “Effect of the AQC on Health Care Spending and Quality” (selected abstract), 17th Annual National Research Service Award (NRSA) Trainees Research Conference, Seattle WA
- 6/2011 “The Effect of Global Payment in Accountable Care Organizations on Health Care Costs” (selected abstract), AcademyHealth Annual Research Meeting, Seattle, WA
- 10/2011 “Health Care Reform and its Implications,” 5th Annual Albert Schweitzer Fellowship Conference, Boston, MA
- 11/2011 “Effect of the AQC on Health Care Spending and Quality” (selected abstract), Gerontological Society of America, 64th Annual Meeting, Boston, MA
- 1/2012 “Effect of the AQC on Health Care Spending and Quality” (selected abstract), American Economic Association/Allied Social Science Associations, Chicago, IL
- 6/2012 “Year-2 Evaluation of the Alternative Quality Contract” (selected abstract), 18th Annual National Research Service Award (NRSA) Trainees Research Conference, Orlando, FL
- 6/2012 “Year-2 Evaluation of the Alternative Quality Contract” (selected abstract), Health Economics Interest Group, AcademyHealth Annual Research Meeting, Orlando, FL
- 6/2012 “Unintended Consequences of Redistributing Income from Specialists to Primary Care Physicians in Medicare” (selected abstract), AcademyHealth Annual Research Meeting, Orlando, FL
- 6/2012 “Effect of the Alternative Quality Contract on Health Care Spending and Quality: Year-2 Results” (selected abstract), AcademyHealth Annual Research Meeting, Orlando, FL
- 6/2013 “Year-2 Evaluation of the Alternative Quality Contract” (Article-of-the-Year session), AcademyHealth Annual Research Meeting, Baltimore, MD
- 2/2014 “Slowing the Growth of Health Care Spending: Evaluations of Current Policy Approaches,” Institute for Healthcare Policy and Innovation (IHPI), Department of Medicine, University of Michigan, Ann Arbor, MI



- 4/2014 “Conducting ROI Analysis,” Health Care Innovations Exchange: Virtual Roundtable on Return on Investment, Agency for Healthcare Research and Quality (AHRQ)
- 4/2014 “Payment Reform in Massachusetts: Effect of Global Payment on Health Care Spending and Quality 4 Years into the Alternative Quality Contract” (selected abstract), Society of General Internal Medicine (SGIM) 37th Annual Meeting, San Diego, CA
- 11/2014 “Health Care Spending and Quality 4 Years into Global Payment for ACOs,” Grand Rounds, Division of General Internal Medicine, Johns Hopkins Medicine, Baltimore, MD
- 6/2015 “Medicare Fee Cuts and Physician-Hospital Integration” (selected abstract), AcademyHealth Annual Research Meeting, Minneapolis, MN
- 12/2015 “Evaluating Strategies for Improving the Value of Health Care Spending” Perelman School of Medicine, University of Pennsylvania, Philadelphia, PA
- 5/2016 “Changes in Quality of Care and Medical Spending for High versus Low Socioeconomic Status Populations under Global Payment” (selected abstract), Society of General Internal Medicine (SGIM) 2016 Annual Meeting, Hollywood, FL (Plenary)
- 6/2016 “Policy Rationale and Implications of Payment Reform,” Risk-based Contracting—Preparing for the Inevitable session American Diabetes Association 76th Scientific Sessions, New Orleans, LA
- 7/2016 “Leadership in the Field of Medicine” (keynote), National Youth Leadership Forum on Medicine, Wellesley, MA
- 9/2016 “Competitive Bidding in Medicare Advantage,” Congressional Budget Office, Panel of Health Advisors, Washington, DC
- 11/2016 “Frameworks in Health Policy and Health Economics,” The MedX Program University of Pennsylvania, Philadelphia, PA
- 11/2016 “Strategies for Slowing Health Care Spending: Implications for Health Systems,” Innovation Speaker Series, Center for Health Care Innovation, UPenn Health System
- 11/2016 “Implications of the Election for Health Care Reform,” Penn HealthX, Perelman School of Medicine, University of Pennsylvania, Philadelphia, PA
- 11/2016 “Medicare Financing Reform after the Election,” Division of General Internal Medicine, Perelman School of Medicine, University of Pennsylvania, Philadelphia, PA
- 2/2017 “Mobile Health and Wellness: Return-on-Investment,” Expert Series: Mobile Health Clinics—Meeting Your Employees Where They Are. Health Resources in Action Webinar.
- 4/2017 “The Changing Mortality and Composition of Opioid-Related Hospitalizations Versus Other Hospitalizations in the United States” (selected abstract), Society of General Internal Medicine (SGIM) 2017 Annual Meeting, Washington, DC
- 4/2017 “Medicare Advantage Benchmarks, Bids, and Rebates Before and After the Affordable Care Act” (selected abstract), Society of General Internal Medicine (SGIM) 2017 Annual Meeting, Washington, DC
- 6/2017 “Mortality and Composition of Opioid Hospitalizations in the United States” (selected abstract), AcademyHealth Annual Research Meeting, New Orleans, LA
- 7/2017 “Making Positive Change Through Medicine and Health Care” (Keynote), National Youth Leadership Forum on Medicine, Wellesley, MA
- 4/2018 “Health Care Spending and Quality 8 Years into Global Payment” (selected abstract), Society of General Internal Medicine (SGIM) 2018 Annual Meeting, Denver, CO

- 6/2018 "Payments to Medicare Advantage Plans and Plan Generosity Before and After the Affordable Care Act" (selected abstract), 7<sup>th</sup> Conference of the American Society of Health Economists (ASHEcon), Atlanta, GA
- 6/2018 Discussant for "Vertical Integration and a Changing Physician Workforce" (by Neprash H, Chernew ME, McWilliams JM), 7<sup>th</sup> Conference of the American Society of Health Economists (ASHEcon), Atlanta, GA
- 6/2018 "The Impact of Workplace Wellness on Health, Health Care, and Employment Outcomes: A Randomized Controlled Trial" (selected abstract), 7<sup>th</sup> Conference of the American Society of Health Economists (ASHEcon), Atlanta, GA
- 6/2018 Discussant for "Did Medicare Advantage Payment Cuts Affect Beneficiary Access to Care?" (by Skopec L, Zuckerman S, Aarons J), 7<sup>th</sup> Conference of the American Society of Health Economists (ASHEcon), Atlanta, GA
- 6/2018 "Changes in Health Care Spending and Quality 8 Years into Global Payment" (selected abstract), AcademyHealth Annual Research Meeting, Seattle, WA
- 7/2018 "Making Positive Change Through Medicine and Health Care" (Keynote), National Youth Leadership Forum on Medicine, Wellesley, MA
- 5/2019 "Putting Patients First" (Panelist), The State of Care: Future of Medicare, The Atlantic, Washington, DC
- 5/2019 "Impact of Workplace Wellness on Health and Economic Outcomes: A Randomized Controlled Trial" (selected abstract), Society of General Internal Medicine (SGIM) 2019 Annual Meeting, Washington, DC (Plenary)
- 5/2019 "Changes in Economic and Clinical Outcomes Under CMS Mandatory Bundled Payments for Joint Replacements" (selected abstract), Society of General Internal Medicine (SGIM) 2019 Annual Meeting, Washington, DC (Hamolsky Award Finalists)
- 6/2019 "Changes in Economic and Clinical Outcomes Associated with CMS Mandatory Bundled Payments for Joint Replacements" (selected abstract), AcademyHealth Annual Research Meeting, Washington, DC
- 6/2019 "Spending on out-of-Network Care in the United States, 2008-2016" (selected abstract), AcademyHealth Annual Research Meeting, Washington, DC
- 6/2019 "Health Care Spending and Quality 8 Years into Global Payment" (selected abstract), 8<sup>th</sup> Conference of the American Society of Health Economists (ASHEcon), Washington, DC
- 6/2019 "The Impact of Fee Changes on Provider Behavior: Evidence from Asymmetric Changes in Professional and Facility Fees for Heart Disease Treatments" (selected abstract), 8<sup>th</sup> Conference of the American Society of Health Economists (ASHEcon), Washington, DC
- 7/2019 "Making Positive Change Through Medicine and Health Care" (Keynote), National Youth Leadership Forum on Medicine, Boston, MA
- 9/2019 "Improving the Evidence Base to Inform Health Policy," NCCIH at 20: A Catalyst for Integrative Health Research, National Institutes of Health, Bethesda, MD
- 10/2019 "Navigating Mixed Payments: What is the Argument to Increase Primary Care Spend?" 2019 Primary Care Conference, Boston, MA
- 7/2020 "Social Learning and Health Care Utilization: Evidence from Spousal Health Shocks" (selected abstract), AcademyHealth Annual Research Meeting (virtual live plenary and virtual pre-recorded session due to Covid-19)
- 7/2020 "Changes in Prescription Drug Spending and Utilization 8 Years into Global Payment" (selected abstract), AcademyHealth Annual Research Meeting (virtual due to Covid-19)

- 12/2020 “Peer Effects and Health Care Consumption: Evidence from Spousal Health Shocks” (selected abstract), Fifth Annual Population Health Science Research Workshop (virtual)
- 3/2021 “Overview of Insurance Markets and Reimbursement for Care,” American Psychiatric Association Annual Meeting (virtual)
- 6/2021 “Hospitalizations, Mortality, and Racial/Ethnic Disparities in the COVID-19 Pandemic,” (selected abstract), COVID-19 and Health Outcomes, Spring 2021 conference, National Bureau of Economic Research (virtual)
- 6/2021 “Peer Effects and Health Care Consumption: Evidence from Spousal Health Shocks,” (selected abstract), 10<sup>th</sup> Annual Conference of the American Society of Health Economists (ASHEcon) (virtual)
- 6/2021 Discussant for “Private Equity, Consumers, and Competition: Evidence from the Nursing Home Industry” (by Gandhi A, et al.), 10<sup>th</sup> Annual Conference of the American Society of Health Economists (ASHEcon) (virtual)
- 6/2021 Discussant for “The Role of Improvement and Consolidation in Medicare Advantage Quality Ratings” (by Sen A, et al.), 10<sup>th</sup> Annual Conference of the American Society of Health Economists (ASHEcon) (virtual)
- 6/2021 “Effect of Traditional Medicare and Medicare Advantage on Spending, Use, and Price: Evidence from Transitions from Commercial Insurance at the Age-65 Discontinuity” (selected abstract), 10<sup>th</sup> Annual Conference of the American Society of Health Economists (ASHEcon) (virtual)
- 7/2021 “What Works in Wellness?” (Panelist), 36th Annual National MD-PhD Student Conference, University of Colorado Anschutz Medical Campus (virtual)
- 7/2021 “Peer Effects and Health Care Consumption: Evidence from Spousal Health Shocks,” (selected abstract), National Bureau of Economic Research Summer Institute (virtual)
- 9/2021 “Primary Care and Behavioral Health Investment for Maine,” Maine Medical Association and Joint Committee On Health Coverage, Insurance and Financial Services (virtual)
- 10/2021 “Low Value Care Measures and Physician-Level Variations,” Industry Working Group Summit, Health Care Markets and Regulation Lab, Harvard Medical School (virtual)
- 10/2021 “Improving the Value of Care: A Policy Landscape,” Department of Medicine Grand Rounds, Memorial Sloan Kettering Cancer Center (virtual)

## International

- 7/2011 “The Effect of Global Payment in ACOs on Health Care Costs” (selected abstract) International Health Economics Association (iHEA), Toronto, Canada
- 5/2018 “Paying for Value: From Theory to Practice,” in Funding for Value session (chair), Shifting to Value-Based Health Care conference, International Consortium for Health Outcomes Measurement and University of Paris, Palais d’Iéna, Siège du Conseil économique, social et environnemental, Paris, France
- 12/2019 “Transparency in Incentives: Outcome-Based Payments,” EIT Health Summit 2019, European Institute of Innovation & Technology, European Union, Paris, France (Plenary)
- 3/2021 “Health Policy in the United States” (invited lecture), Chair of Innovation and Value in Health, University of Paris (virtual)
- 6/2021 “Incentivising wellness in the workplace: a randomized controlled trial” (invited lecture), Food Matters Live 2021, United Kingdom (virtual)



## **Report of Clinical Activities and Innovations**

### **Current Licensure and Certification:**

2014–2017 Commonwealth of Massachusetts, Board of Registration in Medicine, Limited License  
2017– Commonwealth of Massachusetts, Board of Registration in Medicine, Active License  
2019– Board Certification, American Board of Internal Medicine

### **Practice Activities:**

2017–	Primary care practice	Massachusetts General Hospital, Internal Medicine Associates	2 sessions per week
2017–	Inpatient attending (Bigelow teaching service)	Massachusetts General Hospital, Department of Medicine	2-4 weeks per year

## **Report of Education of Patients and Service to the Community**

### **Education of Patients and Service to the Community:**

2006–2008 Mentor, Harvard Manville Mentoring Program  
The Manville School, Judge Baker Children’s Center, Boston, MA  
Served as a big brother mentor at the school, 2 hours per week.

2007–2008 Boston Fellow, Albert Schweitzer Fellowship  
Helped establish an after-school physical activity and nutrition program for at-risk youth with colleagues at the Brookside Community Health Center, Jamaica Plain, MA. 200 service hours.

2008–2012 Resident Tutor, Cabot House, Harvard College  
Primary service: Pre-Medicine Committee (advising pre-medical students, writing committee letters for medical schools, and holding mock interviews).  
Secondary service: tutoring in economics, organic chemistry, and careers.

2013–2014 Copy editor (pro bono), Goroll AH, Mulley AG, eds. “Primary Care Medicine: Office Evaluation and Management of the Adult Patient, 7th Edition.” Lippincott Williams & Wilkins and Wolters Kluwer, 2014.

2017 Feb Expert for online resident Q&A forum, New England Journal of Medicine Resident 360, in public group discussion “From Volume to Value: Understanding the Impact of ACOs and New Care Models in Healthcare.”

2017 Sep Introduction and moderator, “Alternative Models at the State and Federal Levels,” *It Depends What State You’re In: Policies and Politics of the US Health Care System*, Radcliffe Institute for Advanced Study, Harvard University

2017 Nov Participant, Data Science Rountable, “Key Factors for Scientific Impact on Policy,” Harvard Data Science Initiative and Elsevier

2019 Mar Health Policy career paths program, Office of Career Services, Faculty of Arts and Sciences, Harvard University

2019 Mar “Care at the End of Life: Toward a Roadmap for Plans” (Lecture), International Foundation of Employee Benefit Plans, St. Petersburg, FL

2019 Apr “Wellness Wednesday: Workplace Wellness” (Podcast), All Sides with Ann Fisher, 89.7 National Public Radio News, WOSU, Ohio

2019 Apr "Do workplace wellness programmes work?" (Guest), Early Edition, Newstalk ZB, New Zealand

2019 Apr "Do workplace wellness programs work?" (Guest), Health Report, ABC Radio National, Sydney, Australia

2019 May "Impact of Workplace Wellness on Health and Economic Outcomes" (Webinar), Health Enhancement Research Organization

2019 May "Impact of Workplace Wellness on Health and Economic Outcomes" (Webinar), WELCOA and National Wellness Institute

2019 Dec Participant, "Implementation and De-implementation Methodologies for Complementary and Integrative Health Approaches" meeting, National Center for Complementary and Integrative Health, National Institutes of Health

2020 Jun Preliminary data posted for state policymakers: "Economic and Clinical Impact of COVID-19 on Provider Practices in Massachusetts: Interim Results: May 20 – June 17, 2020." Health Policy Commission, Commonwealth of Massachusetts

## Recognition

2009	Top Doctor (Boston Medical Students)	Boston Magazine
2014	30 Under 30 in Science and Healthcare	Forbes Magazine

## Research Citations and Coverage:

### Research Cited in Government Testimony or Policy

Testimony of David M. Cutler, PhD, Committee on the Budget, U.S. Senate (2/29/2012)

Testimony of Dana Gelb Safran, ScD, Committee on Finance, U.S. Senate (6/14/2012)

Department of Health and Human Services, *Federal Register* Vol 77, No 179 (9/14/2012)

Testimony of David Blumenthal, MD, MPP, Special Committee on Aging, U.S. Senate (2/27/2013)

Testimony of Leemore S. Dafny, PhD, Committee on the Judiciary, U.S. Senate (9/22/2015)

Testimony of Andrew Kolodny, MD, Committee on Homeland Security and Governmental Affairs, U.S. Senate (1/17/2018)

Testimony of Matthew Fiedler, PhD, Committee on Finance, U.S. Senate (5/8/2019)

Testimony for H4134 - An Act to improve health care by investing in VALUE, Joint Committee on Health Care Financing, Commonwealth of Massachusetts (1/28/2020)

### Research Covered by Newspaper or News Articles

*New York Times* (9/30/2012; 1/4/2013; 1/5/2015; 1/20/2015; 4/16/2019; 9/9/2019; 10/7/2019)

*Washington Post* (4/15/2011; 1/24/2012; 4/30/2012; 7/12/2012)

*Wall Street Journal* (10/1/2019)

*Los Angeles Times* (12/12/2012; 4/19/2019; 5/13/2019)

*US News & World Report* (10/30/2014; 5/6/2016; 4/16/2019)

*PBS Newshour* (12/4/2017)

*NPR* (4/16/2019)

*CNBC* (12/4/2017; 4/16/2019)

*Boston Globe* (10/29/2014; 11/11/2014; 1/9/2017; 12/5/2017; 7/18/2019)

*WBUR CommonHealth* (7/11/2012; 1/10/2017; 4/16/2019; 7/18/2019)

Other U.S. outlets: *CNN Business*, *Kaiser Health News*, *MinnPost*, *Reuters*, *San Diego Union-Tribune*, *Seattle Times*

International outlets: *CBC News* (Canada), *Deutsches Ärzteblatt* (Germany), *The Irish Times*, *Medical Tribune* (Germany), *Sciences et Avenir* (France)

### Research Covered in Other Outlets

*American Journal of Managed Care Newsroom*, *American Prospect*, *Axios*, *Becker's Hospital Review*, *The British Medical Journal*, *The Business Journals*, *Business Wire*, *CFO Magazine*,

*Connecticut Public Radio, Enterprise Echo, FactCheck.org, FierceHealthcare, Forbes, Fortune Magazine, Harvard Business Review, Harvard Gazette, Healthcare Finance News, Healthcare IT News, HealthDay, HealthExec, HealthLeaders Media, The Heritage Foundation, The Hill, The Incidental Economist, Medical Economics, Modern Healthcare, News Wise, People Management, Psychology Today, Retail Wire, ScienceDaily, Tech Times, The Verge, Vice Media, Yahoo News*

## **Report of Scholarship**

### **Peer-Reviewed Scholarship in Print or Other Media:**

1. **Song Z**, Reinhardt K, Buzdon M, Liao P. "Association between support group attendance and weight loss after Roux-en-Y gastric bypass." Surgery for Obesity and Related Diseases. 2008 Mar-Apr;4(2):100-103.
2. Baicker K, Cutler D, **Song Z**. "Workplace wellness programs can generate savings." Health Affairs. 2010 Feb;29(2):304-311.
3. **Song Z**, Safran DG, Landon BE, He Y, Ellis RP, Mechanic RE, Day MP, Chernew ME. "Health care spending and quality in year 1 of the Alternative Quality Contract." New England Journal of Medicine. 2011 Sep 8;365(10):909-918.
4. Barnett ML, **Song Z**, Landon BE. "Trends in physician referrals in the United States, 1999-2009." Archives of Internal Medicine. 2012 Jan 23;172(2):163-170.
5. **Song Z**, Landon BE. "Controlling health care spending—the Massachusetts experiment." New England Journal of Medicine. 2012 Apr 26;366(17):1560-1561.
6. McWilliams JM, **Song Z**. "Implications for ACOs of variations in spending growth." New England Journal of Medicine. 2012 May 10;366(19):e29(1-3).
7. **Song Z**, Safran DG, Landon BE, Landrum MB, He Y, Mechanic RE, Day MP, Chernew ME. "The 'Alternative Quality Contract,' based on a global budget, lowered medical spending and improved quality." Health Affairs. 2012 Aug;31(8):1885-1894.
8. **Song Z**, Cutler DM, Chernew ME. "Potential consequences of reforming Medicare into a competitive bidding system." Journal of the American Medical Association. 2012 Aug 1;308(5):459-460.
9. **Song Z**, Landrum MB, Chernew ME. "Competitive bidding in Medicare: who benefits from competition?" American Journal of Managed Care. 2012 Sep;18(9):546-552.
10. **Song Z**, Lee TH. "The era of delivery system reform begins." Journal of the American Medical Association. 2013 Jan 2;309(1):35-36.
11. **Song Z**, Hill C, Bennet J, Vavasis A, Oriol NE. "Mobile clinic in Massachusetts associated with cost savings from lowering blood pressure and emergency department use." Health Affairs. 2013 Jan;32(1):36-44.
12. **Song Z**, Ayanian JZ, Wallace J, He Y, Gibson TB, Chernew ME. "Unintended consequences of eliminating Medicare payments for consultations." JAMA Internal Medicine. 2013 Jan 14;173(1):15-21.

13. Blumenthal DM, **Song Z**, Jena AB, Ferris TG. "Guidance for structuring team-based incentives in healthcare." American Journal of Managed Care. 2013 Feb 1;19(2):e64-70.
14. **Song Z**, Fendrick AM, Safran DG, Landon B, Chernew ME. "Global budgets and technology-intensive medical services." Healthcare. 2013 Jun;1(1-2):15-21.
15. Sharp AL, **Song Z**, Safran DG, Chernew ME, Fendrick AM. "The effect of bundled payment on emergency department use: Alternative Quality Contract effects after year one." Academic Emergency Medicine. 2013 Sep;20(9):961-964.
16. Loehrer AP<sup>^</sup>, **Song Z**, Auchincloss HG, Hutter MM. "Massachusetts health care reform and reduced racial disparities in minimally invasive surgery." JAMA Surgery. 2013 Dec;148(12):1116-1122.
17. **Song Z**, Landrum MB, Chernew ME. "Competitive bidding in Medicare Advantage: effect of benchmark changes on plan bids." Journal of Health Economics. 2013 Dec;32(6):1301-1312.
18. Chien AT, **Song Z**, Chernew ME, Landon BE, McNeil BJ, Safran DG, Schuster MA. "Two-year impact of the Alternative Quality Contract on pediatric health care quality and spending." Pediatrics. 2014 Jan;133(1):96-104.
19. Afendulis CC, Fendrick AM, **Song Z**, Landon BE, Safran DG, Mechanic RE, Chernew ME. "The impact of global budgets on pharmaceutical spending and utilization: early experience from the Alternative Quality Contract." Inquiry. 2014 Jan 1;51:1-7.
20. **Song Z**. "Accountable care organizations in the U.S. health care system." Journal of Clinical Outcomes Management. 2014 Aug 1;21(8):364-371.
21. **Song Z**, Sequist TD, Barnett ML. "Patient referrals: a linchpin for increasing the value of care." Journal of the American Medical Association. 2014 Aug 13;312(6):597-598.
22. **Song Z**. "Becoming a physician in the age of payment reform." Healthcare. 2014 Sep;2(3):168-169.
23. **Song Z**, Rose S, Safran DG, Landon BE, Day MP, Chernew ME. "Changes in health care spending and quality 4 years into global payment." New England Journal of Medicine. 2014 Oct 30;371(18):1704-1714.
24. Stuart EA, Huskamp HA, Duckworth K, Simmons J, **Song Z**, Chernew M, Barry CL. "Using propensity scores in difference-in-differences models to estimate the effects of a policy change." Health Services and Outcomes Research Methodology. 2014 Dec 1;14(4):166-182.
25. Scott JW<sup>^</sup>, Sommers BD, Tsai TC, Scott KW, Schwartz AL, **Song Z**. "Dependent coverage provision led to uneven insurance gains and unchanged mortality rates in young adult trauma patients." Health Affairs. 2015 Jan;34(1):125-133.
26. **Song Z**, Chokshi DA. "The role of private payers in payment reform." Journal of the American Medical Association. 2015 Jan 6;313(1):25-26.
27. Basu S, Landon BE, **Song Z**, Bitton A, Phillips RS. "Implications of workforce and financing changes for primary care practice utilization, revenue, and cost: a generalizable mathematical model for practice management." Medical Care. 2015 Feb;53(2):125-132.
28. **Song Z**, McMahon LF Jr. "Rethinking physician payment." Journal of General Internal Medicine. 2015 Feb;30(2):152-154.

29. Loehrer AP<sup>^</sup>, **Song Z**, Auchincloss HG, Hutter MM. "Influence of health insurance expansion on disparities in the treatment of acute cholecystitis." Annals of Surgery. 2015 Jul;262(1):139-145.
30. **Song Z**, Wallace J, Neprash HT, McKellar MR, Chernew ME, McWilliams JM. "Medicare fee cuts and cardiologist-hospital integration." JAMA Internal Medicine. 2015 Jul 1;175(7):1229-1231.
31. Scott JW<sup>^</sup>, Salim A, Sommers BD, Tsai TC, Scott KW, **Song Z**. "Racial and regional disparities in the effect of the Affordable Care Act's dependent coverage provision on young adult trauma patients." Journal of the American College of Surgeons. 2015 Aug;221(2):495-501.
32. Perez KM<sup>^</sup>, Flier L, D'Couto H, Rudder M, Thakker A, Weems J, Wibecan L, **Song Z**, Bitton A, Erb J, Pollack S, Silbersweig D, Sullivan L, Frolkis J. "Behavioral health integration in primary care at Brigham and Women's Advanced Primary Care Associates, South Huntington." Healthcare. 2015 Sep;3(3):169-174.
33. Basu S, Phillips RS, Bitton A, **Song Z**, Landon BE. "Medicare chronic care management payments and financial returns to primary care practices: A modeling study." Annals of Internal Medicine. 2015 Oct 20;163(8):580-588.
34. **Song Z**, Chopra V, McMahon LF. "Addressing the primary care workforce crisis." American Journal of Managed Care. 2015;21(8):e452-454.
35. Loehrer AP<sup>^</sup>, Hawkins AT, Auchincloss HG, **Song Z**, Hutter MM, Patel VI. "Impact of expanded insurance coverage on racial disparities in vascular disease: insights from Massachusetts." Annals of Surgery. 2016 Apr;263(4):705-711.
36. Loehrer AP<sup>^</sup>, Chang DC, Hutter MM, **Song Z**, Lillemoe KD, Warshaw AL, Ferrone CR. "Health insurance expansion and treatment of pancreatic cancer: Does increased access lead to improved care?" Journal of the American College of Surgeons. 2015 Dec;221(6):1015-1022.
37. Aung KK<sup>^</sup>, Hill C, Bennet J, **Song Z**, Oriol N. "The emerging business models and value proposition of mobile health clinics." American Journal of Accountable Care. 2015 Dec: 36-40.
38. Barry CL, Stuart EA, Donohue JM, Greenfield SF, Kouri E, Duckworth K, Simmons J, **Song Z**, Mechanic R, Chernew ME, Huskamp HA. "The early impact of the 'Alternative Quality Contract' on mental health service use and spending In Massachusetts." Health Affairs. 2015 Dec;34(12):2077-2085.
39. **Song Z**, Colla CH. "Specialty-based global payment: A new phase in payment reform." Journal of the American Medical Association. 2016 Jun 7;315(21):2271-2272.
40. Wallace J, **Song Z**. "Traditional Medicare versus private insurance: How spending, volume, and price change at age sixty-five." Health Affairs. 2016 May 1;35(5):864-872.
41. Huskamp HA, Greenfield SF, Stuart EA, Donohue JM, Duckworth K, Kouri EM, **Song Z**, Chernew ME, Barry CL. "Effects of global payment and accountable care on tobacco cessation service use: an observational study." Journal of General Internal Medicine. 2016 Oct;31(10):1134-1140.
42. Haas DA, Bozic KJ, DiGioia AM, **Song Z**, Kaplan RS. "Drivers of the variation in prosthetic implant purchase prices for total knee and total hip arthroplasties." Journal of Arthroplasty. 2017 Feb;32(2):347-350.e3.



43. Lauffenburger JC, Gagne JJ, **Song Z**, Brill G, Choudhry NK. "New and unexpected potentially-disruptive life events: what are the immediate impacts on medication-taking behavior? A case-crossover analysis." BMJ Open. 2016 Aug 4;6(8):e010958.
44. **Song Z**. "MACRAeconomics: Physician incentives and behavioral economics in the Medicare Access and CHIP Reauthorization Act." Healthcare. 2016 Sep 27. pii: S2213-0764(16)30099-9.
45. Stuart EA, Barry CL, Donohue JM, Greenfield SF, Duckworth K, **Song Z**, Kouri EM, Ebnesajjad C, Mechanic R, Chernew ME, Huskamp HA. "Effects of accountable care and payment reform on substance use disorder treatment: evidence from the initial 3 years of the Alternative Quality Contract." Addiction. 2017 Jan;112(1):124-133.
46. **Song Z**, Fisher ES. "The ACO experiment in infancy—Looking back and looking forward." Journal of the American Medical Association. 2016 Aug 16;316(7):705-706.
47. Basu S, Phillips RS, **Song Z**, Landon BE, Bitton A. "Effects of new funding models for patient-centered medical homes on primary care practice finances and services: results of a microsimulation model." Annals of Family Medicine. 2016 Sep;14(5):404-414.
48. Loehrer AP<sup>^</sup>, **Song Z**, Haynes AB, Chang DC, Hutter MW, Mullen JT. "The impact of health insurance expansion on the treatment of colorectal cancer." Journal of Clinical Oncology. 2016 Dec;34(34):4110-4115.
49. **Song Z**, Blumenthal DM. "Expanding payment reform in Medicare: The cardiology episode-based payment model." Journal of the American Medical Association. 2016 Nov 15;316(19):1973-1974.
50. **Song Z**, Rose S, Chernew ME, Safran DG. "Lower- versus higher-income populations in the Alternative Quality Contract: Improved quality and similar spending." Health Affairs. 2017 Jan 1;36(1):74-82.
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### Thesis:

Song Z. "Financial Incentives in Health Care Reform: Evaluating Payment Reform in Accountable Care Organizations and Competitive Bidding in Medicare." Doctoral Thesis. Ph.D. Program in Health Policy, Harvard University, April 2012.

Doctoral Thesis Committee:

Michael E. Chernew, Ph.D. (Chair)

John Z. Ayanian, M.D., M.P.P.

Thomas G. McGuire, Ph.D.

Joseph P. Newhouse, Ph.D.

### Working Papers in Economics:

"Pricing and Pass-through in Response to Subsidies and Competition: Evidence from Medicare Advantage Before and After the Affordable Care Act" (with Daria Pelech)

Abstract: After years of growth, federal payments to Medicare Advantage plans began to decline after the Affordable Care Act (ACA). We exploit variation in those payments caused by the ACA to assess whether insurers respond symmetrically to payment increases and decreases pre- and post-ACA. We find that plans changed their pricing and pass-through to beneficiaries symmetrically, with plans passing through roughly 60 cents for each dollar of payment increases or decreases. However, plans reduced less salient benefits post-ACA by more than they had increased them pre-ACA, even though they left premiums virtually unchanged. Partial pass-through suggests that plans likely operate above cost; plans in more competitive markets responded less to payment changes than plans in less competitive markets. Partial pass-through of payment cuts, combined with quality bonuses and growth in risk scores, may explain the continued growth in Medicare Advantage enrollment post-ACA.

[Download Working Paper](#)

**ATTACHMENT B**

## Attachment B – Material Relied On

### Legal Documents

Consolidated Third Amended Medical Monitoring Class Action Complaint, in this matter, filed November 1, 2021, pp. 2-4.

### Other Documents

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